RECORD

F. R. Fosberg 1951

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Cemetery Map - Section QQQQQQQQQQQQQQQQQQQQQ 603

Cemetery Map - Section RRRRRRRRRRRRRRRRRRRRR 604

Cemetery Map - Section SSSSSSSSSSSSSSSSSSSSS 605

Cemetery Map - Section TTTTTTTTTTTTTTTTTTTTT 606

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Cemetery Map - Section VVVVVVVVVVVVVVVVVVVVV 608

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Cemetery Map - Section XXXXXXXXXXXXXXXXXXXXX 610

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Cemetery Map - Section BBBBBBBBBBBBBBBBBBBBB

Collection and Field Note Book

No. 30

(Oct. 10, 1951 - Dec. 22, 1951)

(33607 - 33907)

Also

* Ecological processes seen or inferred on
JEMO ISLAND

(ABCD 1 - 56)

E N D

begin 33607

end 33907

Standard B&P Blank Books and Loose Leaf Devices

TRADE MARK REGISTERED

Standard Miniature Blank Book

No. 665	9½ x 6	120 Pages Units
No. 667	9½ x 6	200 Pages Units
No. 668	9½ x 6	300 Pages Units

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A BOORUM & PEASE PRODUCT

1951 Calif. 1

Oct. 10 — Mts of Mojave Desert - from air - no vegetation visible until rough country is reached near Cajon Pass. Then shading of brush on north slopes.

Orange groves in general Valley region - Puente, Pomona & E. in very poor condition - dead twigs on almost all trees, some trees more dead than alive - great variation in condition between groves even side-by-side. some show little & no dead wood, others almost gone.
Wendell S. says that it is due to lack of care - that owners think land will be subdivided. But I don't think that is the answer except locally.

Santa Ynez Mts. from air - almost entirely chaparral covered except for forest in higher ravines. Erosion scars very prominent. Dry grass areas here and there. Pine forest on a few northern crests.

3

nos. checked

Labels typed ZK

Oct. 14 – 2 miles south of Hughson
cultivated sandy soil with marshy depression

3 3607 Paspalum distichum
forming sod in marshy depression.

2 08 Polygonum punctatum
in edge of marshy depression

1 09 Helianthus annuus
occasional in cultivated irigated ground.

1 10 Eragrostis
rare in irrigated ground.

2 11 Lotus americanus
common in irrigated ground and on ditch banks.

2 12 Digitaria sanguinalis
common in irrigated cultivated ground

3 13 Heliotropium
occasional in cultivated ground

30 m.

culms ascending from decumbent base; spikes laterally compressed; not eaten readily by cattle.

stems ascending, slightly reddish; flowers greenish-white. herbs up to 0.8 m. tall, branched, all leaves narrow; rays bright yellow, disk very dark ~~brown~~ brown.

large very bushy tangled herb, several stems from base; flowers pinkish white. useful in stabilizing ditch banks; cattle do not eat it green, but will as hay.

culms ascending; eaten reluctantly by cattle.

prostrate, very glaucous, leaves fleshy; flowers purplish white, purple in center; nutlets not at all swollen - fleshy.

1951 Johnston I.

Oct. 22 - brief visit for refueling.
Casuarina equisetifolia has reached bt least 25' tall in residence area.
Large plants (2-3 m) of Calophyllum inophyllum, Terminalia catappa, Hibiscus tiliaceus, Thespesia populnea around base buildings. The Hibiscus, and esp. the Terminalia are ~~slightly~~ somewhat chlorotic.
~~Most~~ All sloping surfaces, such as bomb shelters, etc. quite covered by a blanket of vegetation, Boerhaavia, Cenchrus, Eleusine, Tribulus etc. Flat surfaces mostly kept clear.
Many weeds, Portulaca oleracea Euphorbia hypericiifolia, etc. around base of buildings.
Pluchea odorata common but not as in 1946. P. indica common. One coconut seedling seen.

Pluchea odorata common locally. Euphorbia heterophylla seen but not collected. + apparently does not compete well with Messerschmidia.

Oct. 23 - around Pan am. airport.
Vegetation largely a scrub of Messerschmidia argentea, not more than 2-3 m. tall. Some open areas are pure stands of Fimbristylis, occasionally of Ipomoea tuba, which also climbs over bushes.
Weeds found around roads and buildings, Cenchrus most common, forming pure patches. Heliotropium common - dimorphism not evident, but little time was spent examining it.
Fimbristylis cymosa seems to colonize the most extreme habitats, such as the edges of the airstrips.
Some marshy depression, perhaps artificial, along airstrip away from ~~the~~ terminal.
One plover seen. Thickly ~~Sc~~ scattered billowy cumulus clouds, one light shower at 5 p.m.
No coconuts except seedlings.

1951 Wake Island

Oct. 23 - around Pan-American Terminal
Disturbed ground around installations, coral gravel.

33614		Ipomoea tuba (Schlecht.) Don climbing over bushes	extensive vine; flowers white, closed in late afternoon.
1	15	Messerschmidia argentea (L.f.) Johnst. dominant plant in scrub vegetation	shrub 2 m. tall; leaves ~~flesh~~ fleshy; flowers white, fragrant.
2	16	Scaevola frutescens (Mill.) K. occasional in scrub vegetation	rounded shrub 1 m. tall, flowers white.
2	17	Dactyloctenium aegyptium (L.) Richt. local on roadside	dense small tufts, culms prostrate.
2	18	Euphorbia common locally along roadside	erect, up to 0.8 m. tall; flowers white.
	19	Fimbristylis cymosa R.Br. very common on bare ground	dense small tufts.
1	20	Portulaca oleracea L. occasional on bare ground	prostrate, stems and leaves fleshy, bronze color.
1	21	Pluchea odorata (L.) Cass. locally abundant around air strips, rare near terminal	sterile bush 1 m. tall, aromatic.
2	22	Euphorbia occasional in edges of scrub	plants erect, arching at tips; flowers white.
1	23	Eleusine indica (L.) Gaertn. occasional around buildings	
1	24	Cenchrus echinatus L. common, abundant locally	
2	25	~~Helio~~ Heliotropium anomalum H. & A.	common in bare places and openings in scrub, prostrate to erect, then 1.6 ~~dm~~ m. tall; flowers white with yellow tube, with honey fragrance

1951 Wake Island – Iwo Jima

3 3	6	26	Boerhavia ~~repens~~ diffusa ~~Forst.~~	forming mats on bare ground, prostrate.
			very common	
2		27	Lepturus repens (Forst. f.) R. Br. v	dense tufts
			occasional	
2		28	Euphorbia hirta L. v	erect, arching at tips.
			local on bare ground	
			Oct. 23 – Iwo Jima	
			disturbed ground	
			around airfield installation	
1		29	Chloris inflata Link.	erect, inflorescence
			abundant	purplish.

Oct. 28 Mountains between Odawara and Lake Hakone

Steep slopes covered by scrub of Dierilla with plantations of cryptomeria and Thuja. Some beech and other broad-leaved trees and pines in canyons and on slopes. Upland gentler slopes and rolling country near lake grass-covered, largely uncultivated. Grass rather coarse some of grassland planted irregularly to trees. These uplands not at all thickly populated, while steeper canyons leading up to them are very thickly beset with houses. A large Selaginella of a prickly sort is conspicuous on moist rocks and cliffs.

This whole mountain mass is of mixed pyroclastic material - ash & tuff and volcanic breccia and lava flows, a part of the Fujiyama mass.

Erosion pattern is narrow vertical walled ravines and canyons. Lake Hakone is result of damming a canyon by a great landslide.

Oct. 28 Coast bet. Katase and Chigasaki, Koza-Gun, Kanagawa Pref.

Dunes of dark gray sand largely planted to a 2-needled pine. These plantations not at all healthy-looking on flat parts, stunted and yellowish, but on dune ridges several times larger and dark green.

33630 Pinus tens abundant on bare sand

1951 Japan, Honshu

Nov. 3 - near Katsuura, Chiba Peninsula.

33631 Miscanthus
3 abundant on steep road-cuts in deep alluvial soil.

tangled masses, lower stems decumbent, fruiting culms ascending.

Nov. 3 - near Katsuura, rolling ground intensively cultivated with truck crops. Surface soil very dark brown, almost black. Examined a profile here, in moist soil along roadside. Typical Ando brown rolling soil. A1 horizon dark brown, fluffy granular, silt-loam.

about 1 m. deep, underlain, sharply by a B of yellow-brown silt-clay-loam, heavier but somewhat friable somewhat plastic, this 1 m. ~~or~~ or more thick. A horizon about pH 8, abnormal for Ando series, but possibly due to dust from road (not to likely); B horizon sl. more acid.

Nov. 3 - firing range ~~near~~ about 2½ mi. N.E. of Haramachi. Chiba Peninsula, slightly irregular grassland with scattered pines, small scattered shrubs.

Ando soil, profile examined with A horizon about 25 cm. thick, as in Katsuura profile but slightly acid. B horizon as in Katsuura profile, at least to 42" depth.

1 32

rare, local on bare soil in

2 33 Valeriana
common in

erect, fruits maroon purple

1 34 Cassia
local in

erect; flowers yellow, brown outside.

2 35 Ligustrum
occasional in

shrub 1 m. tall; fruit blue

33676 Quercus
common shrub in

Nov. 6 - n. south of Kobe along the seacoast, (seen from train window)

Low coastal hills show rather conspicuous erosion.
Pittosporum tobira growing spontaneously along cuts and eroded places.
Miscanthus common in waste spots at low alts.
Rice culture general. Rice being harvested. Fields ~~f~~ vary from still somewhat green to completely ripe, harvested, in some cases even threshed. Dried by hanging.
Dwarf bamboo one of the commonest weeds. (several species)
A gnarled small pine with an almost black trunk is locally common, mostly on low hills.
The plains are almost entirely in rice, except for some truck crops.

shrub 1 m. tall, ovoid fruit found in leaf axil (certainly belongs to this plant).

Hills around Kobe south of Himeji brushy and with some small forest of pine, erosion scars and quarry scars common. Only lowest slopes usually cultivated, some indications of terracing above but apparently abandoned. Small villages, with gray-tiled roofs very common, 3-5 in sight at a glance from train window in flat valley bottoms. Transitions from hills to flats very abrupt.

South of Himeji -
Extensive rice fields. As mts are approached typical landscape is flat valley bottoms, ~~surrounded by~~ planted to rice, ~~mostly~~ surrounded by abrupt steep wooded small mountains, the wood ~~Pinus~~ pine in places, scrubby deciduous in others.

Taller near bases of hills and in ravines, bamboo abundant in many places near bases of hills. Villages lining the edges of the valleys against the bases of the hills, in places almost continuously. Roofs generally of gray tile but many well done straw-thatch ones, the thatch very compact and 6-12" thick! Diospyros kaki very common around houses.

Ridge tops and steepest slopes covered by a thin scrub, ground showing through. Erosion scars less common. Some bare rock cliffs.

As somewhat greater altitudes are reached (700' or so) other conifers begin to appear. Flat valleys become smaller and less common.

Near Mantoroi - much rice, but also other crops. What appears to be either mulberry or ramie, growing appr. 1-1.5 m. tall, single finger thickness stems.

Several other things dried in same manner by hanging,

as is rice. Persimmons dried by hanging tied in strings on walls of sunny sides of houses.

~~South of~~ West of Kurashiki the landscape changes somewhat. The hills are more gently sloping and cultivated in places to the tops, though there are patches of woods, mainly pine. Flats rice-covered. Higher hills more inland steep and wooded. A red-trunked pine is more common here than the gray-trunked one.

Citrus first noticed west of Fukuyama a few miles. Sugar cane common in garden-size patches here, too. Citrus on slopes.

Terracing in Onomichi area done in fashion that merely reduces slope, does not eliminate it. Walls with gentler slopes above them.

Near Yoshino
Robinia pseudoacacia common on r. cuts.
Potatoes commonly cult.
east of here much rice is cultivated apparently without irrigation & with very little, on small terraces
Palms (Trachycarpus?) ~~common~~ occasional all along this coast.
Forests on slopes mainly pine but with some deciduous trees, these just beginning to change color.
Eriobotrya very common.
Terracing intensive from here toward Hiro~~shima~~.
Many terraces irrigated by a small ditch on the upper side, at foot of wall of next terrace. Terraces mostly somewhat sloping.

Up the bay from Kure the hills became steep and rocky. The sides are mostly cliffs. But even here, in residual patches of soil are tiny terraces devoted to gardens. The soil is fine and very light colored. Even on the lower

slopes this ~~soil~~ is so shallow that the terraces cannot be more than a foot or two wide.
West of Hiroshima bamboo is abundant, but much of it seems to be in a dying condition. Pine dominates the landscape with bamboo an important minor feature.
Somewhat south ~~west~~ of Hiroshima, near Onoda, I thought I saw a slope covered by Gleichenia linearis (wet aff.) but could not be certain.
South of Iwakuni the bamboo also seems yellow and dry. But could it be merely deciduous?

1951 Japan Kyushu

Nov. 8 - Fukuoka

33637		Rhus	shrub 1 m. tall, leaves turning orange-red.
2		in fencerow under pines on university campus	
3	38	Lolidago japonica Kitamura under pines on university campus	erect, flowers yellow.
3	39	Litsea sieboldii on wooded sea-cliffs	tree 8 m. tall, flowers dull yellow.
2	40	Cryptobalanopsis glauca in park	small tree 6 m. tall.
3	41	Carpatia japonica in small thicket under pines on university campus	vine climbing into small trees.

Pines are the dominant tree in Fukuoka, everywhere where there is not solidly built city. Mainly "red pine" Pinus thunbergii. ("Black pine" is P. densiflora. ~~Trunk~~ Bark of red pine may be black or red.)

Nov. 9 - R.R. trip bet. Osaka and Tokyo - train window observations.

Mts. bet. Hikone and Gifu - steep rugged mountains with flat valleys between.
Country around Lake Biwa looks like old bed of lake now filled in & slightly elevated.
Flat land devoted to rice culture. Harvesting now in full swing. These valleys thickly populated.
Mountains steep and abrupt in the southwestern part of this stretch, slope becoming more gentle and relief softened northward.
Southward these hills are pine-clad. South of the middle cryptomeria and ~~Thujopsis~~ Chamaecyparis obtusifolia appear and soon dominate the scene.
Cleared areas have a deciduous scrub that is changing color, but this is planted with conifers which soon overtop the broad-leafed trees and shrubs.

Plains around Ogaki vast, flat, and rice-covered.
E. of Ogaki in plain are occasional ponds, some of them red with azolla.
Broad sandy river-beds confined by dykes have pioneer vegetation, occasional garden plots scattered in them.
Ficus carica common around dwellings.

Along the coast east of Nagoya are low hills of fine alluvium and some dunes.
These are mostly planted to pines, but some slopes have a dense scrub.
North of Harumatsu the parts of these hills that cannot be terraced are covered by tea plantations. These are in small patches and the plants are mostly in low, dense, rounded box-like hedges - a low round shoe-button-like single plants - seemingly kept picked back too low for comfort in harvesting.

1951 Japan

The river-beds here are very broad with braided patterns, mostly gravel flats.

1951 Japan to Tasongi

Nov. 16-24 - Boat trip on direct course from Tokyo to Tasongi
No living thing seen for the whole trip except a few flying fish after the fifth day.

Nov. 25 Tasongi atoll
Inspected western islets through binoculars from ½ mile a more, approached reef near boat passage at high tide to within 50 yards.

South Islet - no vegetation visible. Islet quite rocky, mostly rock rather than sand, large
At the north end of the reef a row of large rocks visible from well south of center of west side, through glasses.
Pokaahu Islet almost completely covered by Messerschmidia on lagoon side.

southerly to southeasterly winds almost the entire trip. Sun only after third day.

sh. not identified - have white on top of heads, whitish wing bars (on top)
Frigate birds
common, at least 25 seen at one time.
Several pairing terns Gygis alba and a pair of sooty terns, Sterna fuscata flew around ship.
One Dusky Shearwater (?)
Puffinus? hermineri
skimming waves.
Large flock of boobies Sula sp. & spp. fishing ½ mile offshore.
One albatross, prob. Black-footed (Diomedea nigripes) flew by ship during morning.

1951 Marshall Is.

Nov. 25 - in late afternoon followed south and east coast up to north end of Kamome I. islet.

South Islet absolutely devoid of vegetation, but with large boulders, some light gray, others darker, two largest black, scattered abundantly. Impossible to tell if in place or thrown up by waves.

Polkaaku I. vegetation rather sparse but large Messerschmidia rather covering islet, apparently some Scaevola, but no small bushes.

Entire south and east coast (all islets) characterized by a high seaward ridge a boulder rampart, and by almost continuous beach-rock a raised reef-rock, appearing about 1+ m high, variously worn away, cut into boulders here and there, and into mushroom shaped rocks on reef flat at bottom of beach.

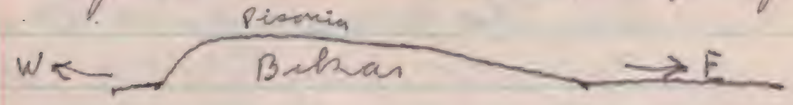
Passes bet. two islets west of ~~Lapla~~ Libylla and Libylla itself are filled till I don't think water would ever go over except in storms.

These, Libylla and next one north are well vegetated by a loose cover of Messerschmidia and Scaevola, usually extending well down on outer side of seaward ridge, but in places this bare to top. A few large boulders & exposures of beach rock on top. Large logs (Douglas fir ?) here and there on beach.

Birds occasional or common in trees and coming in from s.w. & n. usually flying fast and close to waves (boobies and sooty terns). (One white booby with white tail seen, others resident.

Kamome Islet veg. seems in poor cond. (light not good) islet is the bird rookery of the lot. - Millions of birds over it like a swarm of bees.

Nov. 26 - Approaching islet - met by 6 frigate birds with white heads (incl. top) and dark breasts, white belly and flanks, whitish band on upper wing coverts.
~~Spread~~ Lila aula definitely ident.
All three larger islets, viewed from east, largely covered by Pisonia forest, one coconut seen on middle ~~key~~ small grove on inner peninsula of Bikar I., on this a belt of Messerschmidia outside Pisonia, a few beaersla at top of beach.



Many birds over all three islets.

Fregis very common.

Fregatta here have white heads, rusty neck, esp. throat, black breast, a white patch on belly & flanks of varying size, sometimes

with white extension up into armpits, also prolonged backward almost to anal region. White bars on wing covert areas. Bill white.

Nov. 28 - Utirik I. - s. w. corner of island.

33644 Boerhavia diffusa v. tetrandra
5 sparse coconut grove with ~~scrub~~ clumps of Scaevola.

6 42 Fimbristylis cymosa R.Br.
common ground cover in sparse coconut grove

5 43 Messerschmidia argentea (L.f.) ✓
component of vegetation on recent coral sand beach

Sky largely overcast, scattered showers, brisk tradewind.
Hygr. reading 8:40 p.m.
Dry 27° C Wet 26.5° C
10:20 p.m. " 26° C " 26° C

Vial #1 - spiders on webs spun between clumps of bushes - orb weavers.

Vial #2 - misc. insects caught beating Scaevola

33645 ~~undetermined~~
5 on sea anemone colonies just at low tide level on lagoon beach

5 46 Caulerpa racemosa (Forssk.) J. Ag. (det. under and between broken dead coral rocks on rubble bar in lagoon at low tide mark

(Forst.) Heim. prostrate to ascending, longer stems prostrate, flowers pinkish. Leaves stiff, brittle. clumps, culms ascending "dralij' man" a "deralij' man"

Johnst. shrub 2 m. tall. leaves flashy, silvery green; flowers white, fragrant.

About 50 yards out from high tide mark on the lagoon beach is a bar of rubble, cobble size and smaller, some boulders, evidently stripped from the narrow land strip by a storm and swept into lagoon - very little life except tiny sponges, a few algae, a few echinoderms, and many small crabs.

Taylor 1955) pale green, rhizome terete, peltate processes tending to be hemispherical.

Nov. 29 - Utirik Islet.
Open coconut grove with grass or Taro ground cover. Many coconut and Pandanus trees knocked down by typhoon (said to have occurred March 1951).

Vial #3 bottom layer - spotted beetles in fungi (#33655) on dead Pandanus trunks, others and spider on same trunks.

Vial #4 bottom layer and any very tiny ~~xxx~~ animals, any ants - in axils of dead lower leaves and green leaves just above them on Pandanus tectorius.

Vial #5 - bottom layer - fly larvae ~~in~~ wet decayed spot under ~~xxxx~~ fungus (#33647) on fallen coconut trunk. Other animals - isopods, snails, under mat of ~~xxxxx~~ Thuarea at base of standing coconut tree.

several fungi are conspicuous on the dead and even the living fallen trees.

Vial #3 top layer (Nov. 30) Misc. on ground - isopod. black ant running around (bites rather viciously). Solenopsis (?) attracted to food can. Big yellow ant living in thick vegetation in bottom of abandoned taro pit.

Vial #4 top layer (Nov. 30) coccinellids and long horned grasshopper, on Messerschmidia and Scaevola in scrub on outer part of island.

3 5	3647	fungus on fallen coconut trunk	
2	48	 on fallen coconut trunk	
3	49	lichen on standing coconut tree, upper side of ~~trunk~~ leaning trunk	dark dull green when ~~wet~~ moist.
3	50	lichen on coconut trunks, very common.	
5	51	lichen on trunk of breadfruit tree	dark dull green when moist (looks like Nostoc, but will, apothecia) bright green, sterile.
5	52	moss on trunk of coconut tree, rather fairly common.	
5	53	Eragrostis amabilis (L.) W.d.A. ✓ common around trails and dwellings	loose small tufts "ujoij" (name for grass)
5	54	fungus on dead fallen Pandanus trunks and branches	brilliant vermillion; flat.
5	55	fungus on dead fallen Pandanus trunk and branches	variable but seemingly one species.
2	56	Gossypium single plant planted in village. 30 yds from lagoon	many-stemmed plant 2 m. tall, heavily fruiting; leaves very chlorotic.
2	57	Mirabilis jalapa L. ✓ single plant growing in cemetery	bushy many-stemmed herb, flowers white, closed when collected, just after noon. not chlorotic.
2	58	Asclepias curassavica L. ✓ several plants in cemetery and around houses	erect herb; crown orange, corolla red. not especially chlorotic. "yelo"

33659 Ocimum sanctum L. ✓
2 small patch near house

5 60 on trunk of breadfruit tree

5 61 Ipomoea tuba (Schlecht.) Don ✓
large patch on ground

5 62 Euphorbia chamissonis Boiss. ✓
common locally, center of island

5 63 Eleusine indica (L.) Gaertn. ✓
common in trails and recently disturbed places

5 64 Digitaria microbachne (Presl) Henr. ✓
common around village and near trails

1 65 Cenchrus echinatus L. ✓
rather rare along trail

5 66 algae
in open pit well

Profiles #1, #2, #3

#1 in open coconut grove on path just out of village.

#2 in open grassland in middle of trail

#3 in open coconut grove on relatively high rocky ground just inside outer beach on trail

aromatic, flowers purplish.
"katarin"

prostrate, extensive, flowers white (open 10:30 a.m.) stems ascending, plant tends to be flat-topped; floral glands white. "mal dok"

small tufts, culms erect or ascending.
"ujoij"

small tufts, bases decumbent and rooting

Profile #1 4 samples — 1-1, 1-2, 1-3, 1-4
Surface covered with loose coral fragments, gravel size.
A horizon — layers 1, 2, 3 total 2.7'.

layer 1 — black (10YR-2/1) flecked with pale.
0-0.7' Str. — coarse, irregularly gravelly-granular.
Tex. — friable, somewhat plastic when worked. filled loosely with grass roots.

layer 2 — black (10YR-2/2) thickly flecked with pale.
0.7-1.1' Str. — irregularly granular, bound with coconut roots.
Tex. — friable, sandy-crumbly

Marshall Is. Utirik atoll, Utirik I.
Just e. of village
Nov. 29, 1951 open coconut grove, grassy.

33459 Ocimum sanctum L. ✓
2 small patch near house
5 60 on trunk of breadfruit tree
5 61 Ipomoea tuba (Schlecht.) Don ✓
large patch on ground
5 62 Euphorbia chamissonis Boiss. ✓
common locally, center of island
5 63 Eleusine indica (L.) Gaertn. ✓
common in trails and recently disturbed places
5 64 Digitaria microbachne (Presl) Henr. ✓
common around

aromatic, flowers purplish. "katarin"

prostrate, extensive, flowers white (open 10:30 a.m.) stems ascending, plant tends to be flat-topped, floral glands white. "mal dok"
small tufts, culms erect or ascending. "ujoij"
small tufts, bases decumbent and rooting

sample 1-3 layer 3 — black (10YR-3/1) mottled with gray
1.1-2.7' Str. — coarse, irregularly granular a few coconut roots.
Tex. — very friable, loose

C horizon — layer 4 2.7'-4' — not dug any deeper.
sample 1-4 layer 4 — very pale brown (10YR-7/3-8/3)
Str. — granular.
Tex. — very friable, sandy

very few coconut roots in this horizon or A

Profile #2 samples 2-1, 2-2, 2-3, 2-4, 2-5, 2-6

A1 horizon layer 1
0-0.2' — black (10YR-2/1) thickly flecked with light brown.
sample 2-1
Str. — loose granular.
Tex — coarse foram sand, completely friable but very slightly plastic when worked.

A2 horizon — layer 2 small pieces of pumice
0.2-0.7' — salt-pepper brown (10YR-4/2-4/3) becoming lighter downward
sample 2-2
Str — loose granular.
Tex. — coarse foram sand, loose.

Marshall Is. Utirik atoll, Utirik Island.
center of island S. of village.
Nov. 29, 1951
Open grassy patch in coconut grove. Uptown.

33659 Ocimum sanctum L. ✓
2 small patch near house
5 60 [illegible]
on trunk of breadfruit tree
5 61 Ipomoea tuba (Schlecht.) Don ✓
large patch on ground
5 62 Euphorbia chamissonis Boiss. ✓
common locally, center of island
5 63 Eleusine indica (L.) Gaertn. ✓
common in trails and recently disturbed places
5 64 Digitaria microbachne (Presl) Hen. ✓
common around

aromatic, flowers purplish.
"katarin"

prostrate, extensive,
flowers white (open 10:30 a.m.)
stems ascending, plant tends to be flat-topped, floral glands white. "mal dok"
small tufts, culms erect or ascending.
"ujoij"
small tufts, bases decumbent and rooting

Buried A horizon – 0.7–1.8' layer 3
sample 2-3 black (10YR-2/1–4/1) becoming lighter downward.
Str. – loose granular
Tex. – coarse foram sand, loose.

C horizon – layer 4
1.8'–7' – Pinkish gray (5YR-6/2) to pink (5YR-8/3)
samples 2-4, 2-5 (upper foot pinkish gray coarsely irregularly mottled with grayer, changing gradually to pink)
Str. – very loose granular, at 5' becoming irregularly partially hard-caked (sample 2-5), roots to 5'.
Tex. – coarse foram sand. loose to hardcaked.
C horizon – layer 5 – wet small gravel (sample 2-6) below 7' on [illegible]

---

slightly moist

loose coconut roots in all layers, more in layer 2

Profile #3 (anomalous – series of buried profiles) [illegible] with irregular fragments
samples 3-1, 3-2, 3-3, 3-4, 3-5.
Layer 1 – 0–1.3' – salt & pepper (5YR-8/2, 5/1, 3/1, averaging 6/2) pinkish.
sample 3-1 Str. granular Tex. loose sand with irregular coral fragments
1st 2
Buried profile – layers 2 & 3.
sample 3-2 Layer 2 – 1.3–1.9' – (10YR-3/2)
Str. granular, sl. firmer than other layers.
Tex. loose sand with irregular coral fragments.
sample 3-3 Layer 3 – 1.9–2.3' – (5YR-8/2)
Str. granular
2nd 2 Tex. loose sand with irregular coral fragments
Buried profile – layer 4 – 2.3–3' –
sample 3-4 (5YR-8/2) darkened a little at top.
Str. granular
Tex. loose sand with irregular coral fragments.

Marshall Is. Utirik atoll, Utirik Islet
S. of village near ocean beach, just inside height of land, 11' above beach-rock.
Nov. 29, 1951 – Open coconut grove, grassy.

33659 Ocimum sanctum L. ✓
2 small patch near house
5 60
on trunk of breadfruit tree
5 61 Ipomoea tuba (Schlecht.) Don ✓
large patch on ground
5 62 Euphorbia chamissonis Boiss. ✓
common locally, center of island
5 63 Eleusine indica (L.) Gaertn. ✓
common in trails and recently disturbed places
5 64 Digitaria microbachne (Presl) Henr. ✓
common around

Buried profile - layer 5
3 - 4.5' (then coral fragments became so numerous and hard packed that digging became impractical)
gray (5YR - 5/1) becoming lighter downward, irregularly mottled or splotched with pink (5YR - 8/2 - 8/3)
Str. rather hard-packed, crumbly.
Tex. sandy rubble with irregular coral fragments.
large cobbles and even a few boulders scattered through this entire profile.

aromatic; flowers purplish. "katarin"

prostrate, extensive, flowers white (open 10:30 a.m.) stems ascending; plant tends to be flat-topped; floral glands white. "mal dok"
small tufts, culms erect or ascending. "ujoij"
small tufts, bases decumbent and rooting, culms erect. "ujoij"
small tuft, culms ascending "lekkelek"
green, submerged and floating.

± 200 yard diam. circle, open coconut grove, incl. profile #3, has 120 standing coconut trees, 47 knocked down by typhoon, all pointing s. to s.e., no young trees less than 2 years old. ± general level about 11 ft. above edge of beach rock. Trees formerly spaced 15 - 20'. Uneven mat of Lepturus, some Digitaria, some Fimbristylis, a few Pandanus, most of large ones knocked down by typhoon.

Nov. 30 – Utirik Islet

Soil profile #4 taken near s.w. end of coconut grove, slightly nearer outer than inner beach, (in the grove)

The three layers here probably have no relation to each other – probably represent three depositions of material. The total depth of loose material on reef-rock is not great.

Beyond the end of the grove the loose material has been swept away by the 1951 typhoon (my guide confirms that the water came up over the flat part of the island.) Root systems of shrubs are exposed – very extensive.

Soil profile #5 is from toward the center of the island directly east of center of village, in sparse coconut grove, ground covered by grass (Digitaria), Tacca, and abundant Euphorbia chamissonis. Soil here is also shallow, but upper two layers perhaps

slightly moist

Some coconut roots in all layers.

Profile #4 hole dug 3.2' to surface of reef-rock. anomalous profile.

sample 4-1

Layer 1 – 0–1.6' reddish gray (5YR–5/2) with some fine black (5YR–3/1), varying to blotches of light reddish brown (5YR–6/3)

undifferentiated except that coconut roots are more abundant in bottom 0.3', grass roots common in top.

Str. – granular, loose.

Tex. – ~~loose~~ sandy with irregular coral fragments, (many of pebble or even cobble size in bottom of layer).

sample 4-2

Layer 2 – 1.6–2.2' pinkish gray (5YR–6/2)

Str. – crumbly, firm.

Tex. – loamy sand with some gravel.

Marshall Is., Utirik atoll, Utirik Islet, inside of but near w. end of coconut grove, nearer outer than inner beach

Nov. 30, 1951 Open coconut grove, grassy, some bushes.

Tex ... coral ... upp...

Layer 2.

Str.

Tex

sample 5-2:

Marsh... along t... Japan... Nov. 30, ... of Dis...

...Tex rub... pi...

Encountered ... very str... peculiar ... as it c... rose to ...

Taro pit b... level of ...

Water sam...

Layer 3. – 2.2–2.5' pink (5YR–8/3)
sample 4'
Str. firmly packed, crumbly.
Tex. very friable, fine sand with some coarser particles.

Layer 4. 2.5–3.2' mixed pinkish gray averaging about 5YR–7/2
sample 4-4.
Str. loose, not well packed.
Tex. gravel with some coarse sand

(Coconut trees up over the flat part of the island.)
Root systems of shrubs are exposed – very extensive.

Soil profile #5 is from toward the center of the island directly east of center of village, in sparse coconut grove, ground covered by grass (Digitaria), Tacca, and abundant Euphorbia chamissonis. Soil here is also shallow, but upper two layers perhaps

1951 Marshall Is. Utirik atoll.

are really horizons of one depositional layer.
Bedrock here seems to be indurated loose material rather than reef-rock.

In this area are a number of elongate depressions or trenches, about 10 m. wide, 2 m. deep, that are doubtless long-abandoned taro-pits. They are said to have been made by the old people. They are old enough to have coconut trees at the

Profile #5 3 layers totaling 2.5'

slightly moist

Layer 1. 0–0.7' black (10YR–2/2)
sample 5-1
Str.- loose granular, very friable
Tex.- loamy sand with a few small coral fragments, grass roots in upper part, a few coconut roots.

Layer 2. 0.7–1.5' gray-pink (7.5YR–6/4) blotched with a salt + pepper mixture of 10YR–3/1 and 6/2, appearing gray.
Str. – loose granular.
Tex. – coarse sandy with some coconut roots.
sample 5-2:

passing gradually into layer 3

(over)

Marshall Is. Utirik atoll, Utirik Island.
along trail east of village, 170 meters of last Japanese installation.
Nov. 30, 1951 Sparse coconut grove, ground cover of Digitaria, Euphorbia chamissonis, Tacca. Trees [illegible] high.

10 1951 Marshall Is

Layer 3. - 2.2–2.5' pink (5YR-8/3)

Sample 4-3 Str. firmly packed, crumbly.
Tex. very friable, fine sand with some coarser particles.

Layer 4. 2.5–3.2' mixed pinkish grays averaging about 5YR-7/2

Sample 4-4. Str. loose, not well packed.
Tex. gravel with some coarse sand

Layer 3 1.5–2.5' pink (7.5YR-8/4) blotched above with gray (as in blotches in layer 2)

Sample 4-3 Str.- loose granular.
Tex.- foram sand, with a few coconut roots.

resting on a consolidated small gravel that is pink, very firm to pick, but after pieces are detached they crumble somewhat. coconut roots penetrate this.

Utirik atoll. 43

are really horizons of one ~~its~~ depositional layer. Bedrock here seems to be indurated loose material rather than reef-rock.

In this area are a number of elongate depressions or trenches, about 10 m. wide, 2 m. deep, that are doubtless long-abandoned taro-pits. They are said to have been made by the old people. They are old enough to have coconut trees at the

Profile #6 3 layers in bottom of long-abandoned taro pit. A-C

Layer 1 0–1.9' black (10YR-2/1-2/2) becoming somewhat lighter downward, somewhat flecked with pale grains.
Sample 1-1 Str. crumbly-granular
Tex. mucky loam with some coarse sand, plastic when worked. roots in upper 1/3.

Layer 2 1.9–2.5 Gray (10YR-4/1) thickly flecked with pale brown (10YR-7/3)
Sample 2-2 Str. sticky granular (wet), firm.
Tex. coarse sand with some clay and much small gravel and some irregular coral fragment

Marshall Is. Utirik atoll, Utirik Island east of village on trail, 200 m. E. of last Japanese installation.
Nov. 30, 1950. Glossodendrum thicket in bottom of old abandoned taro pit.

Layer 3. = 2.2–2.5' pink (5YR-9/3)
Sample 3-1 Str. firmly packed, crumbly.
Tex. very friable, fine sand with some coarser particles.

Layer 4. 2.5–3.2' mixed pinkish grays averaging about 5YR-7/2
Sample 4-4. Str. loose, not well packed.
Tex. gravel with some course sand

Layer 3 (C horizon) 2.5-3.2' (to bottom of hole)
pale brown (10YR-7/3)
Sample 6-3 Str. hard, firmly packed.
Tex rubble with some sand, pieces of coral to 3-4" thick.

Encountered water in C horizon, at about 3', very strongly smelling of H_2S, peculiar sweet taste, 83°F temp. as it collected in hole; rose to 2.3' in 2½ hours. (below level of bottom of taro pit)

Taro pit bottom perhaps 6 ft. below level of surrounding country

Water sample marked 6—4

are really horizons of one ~~to~~ depositional layer. Bedrock here seems to be indurated loose material rather than reef-rock.

In this area are a number of elongate depressions or trenches, about 10 m. wide, 2 m. deep, that are doubtless long-abandoned taro-pits. They are said to have been made by the old people. They are old enough to have coconut trees of the general size in the surrounding plantation growing in their bottoms, also fair sized breadfruit trees.

Profile #6 was dug in the bottom of one of these, now filled with a thicket of Clerodendron. The soil was black, and the water table is only 2.3' below the ground. The water smells very strongly of H_2S.

Beyond here, to the east, is a large area of open coconut grove with Taro making up a large part of the ground cover, otherwise grass and, locally, Euphorbia Chamissonis.

The eastern part of the ~~islet~~ is open coconut grove with grass. Before the grass is reached there is a small thicket of Cordia, guettarda, and Pisonia, almost smothered by Ipomoea tuba.

On the east end of the islet is an area of broken coral, with no obvious soil. This is mostly covered by a scrub of Scaevola, dense and tangled, 2-3 m. tall at inner edge, getting lower outward, badly battered by the typhoon at outer edge, with scattered through it badly beaten old trees of Messerschmidia, Pisonia, Guettarda, Cordia etc. about twice as tall as the scrub. In the scrub are many dead branches of these lying tangled in the scrub. This scrub is so dense that it is laborious to cut a trail through it. It is also tangled with Ipomoea tuba.

On bare broken coral inside this belt of scrub was found a colony of Fleurya ruderalis, also much Boerhavia diffusa of the extensive, pointed leafed, capitate infl- form.

Two species of lizards noted on island - a small slender brown skink, and a large, swift-like green one, up to 8" long. A series of these latter were secured and is in jar #1.

In jar #1, also are two specimens of the large red eyed hermit crab; from of a smaller white and purple banded one; and two specimens of a burrowing land crab a "ghost crab" of a very pale color, dug out of burrows in the sand flat of the west part of the island. The hermit crabs were eating meat from split young drinking coconuts.

Vial #7 - has earthworm from upper layer of profile #6. Lot

In jar #2 are a number of hermit crabs; one land crab and some skinks.

33667 Guettarda speciosa L. v
5 common in ~~tree~~ sparse coconut grove and in scrub along outer edge of islet — shrub 2 m. tall, bushy, (others seen up to 5 m. tall); flowers white, very fragrant. "iwut"

9 69 Suriana maritima L. v
common in scrub on outer part of islet, outside coconuts, on coral debris. — low shrub, spreading; flowers yellow, petals falling easily.

5 69 Leucaena glauca (L.) Benth. v
very local, around old Japanese installation, center of west arm of islet. — shrubs 3-4 m. tall, flowers cream-white.

1 70 Carica papaya L. v
common, this from near center of west arm of islet. — plant 3 m. tall, flowers cream white.

2 71 Cordia subcordata Lam. v
~~common~~ occasional in sparse coconut groves, sometimes forming small thickets. — shrub 3 m. tall; all seen sterile. "kano"

3 72 Euphorbia heterophylla L. v
very local, ~~abundant where seen, see colony seen~~, around abandoned dwelling sites — bracts partly scarlet.

5 73 Clerodendrum inerme (L.) Gaertn. v
common in center of islet, especially around abandoned taro pits, forming low thickets. — shrub 1-1.5 m. tall; flowers white with maroon-purple stamens and style. "ulij"

2 74 Polypodium scolopendria Burm. f. v
in small pit around old Japanese installation, not seen elsewhere

5 75 Portulaca samoensis A. Gray. v
common in sparse coconut groves in center of islets on bare ground. — prostrate, fleshy, root tuberous; flowers yellow, closing before mid-day.

33676 Pisonia grandis R.Br. v
4 scattered in Scaevola scrub on outer part of north end of islet.

3 77 Ipomoea tuba (Schlecht.) Don v
common, tangled in inner edge of Scaevola scrub on north end of islet.

3 78 Calophyllum inophyllum L.
rare, one tree seen near center of island.

6B 79 †Lepturus radicans Gaud. v
local on bare broken coral just inside belt of Scaevola scrub on north end of island.

5 80 Boerhaavia diffusa L.
common on bare broken coral just inside belt of Scaevola scrub on north end of island

Dec. 1 - same.

9 81 Lepturus repens (Forst.) R.Br. v
one of first colonists on bare coral sand (also dominant ground cover under coconut trees in outer parts of ~~coconut~~ coconut grove)

5 82 Pemphis acidula Forst. v
in mixed scrub on sand spit (small dunes)

x 83 Artocarpus altilis (Park.) Fosb. v
planted in village

tree 5 m. tall, ~15 cm. thick; leaves pale green; all seen sterile.

vine, extensively twining, climbing in shrubs and trees.

stems succulent, red.
"nene bwtebwt"

prostrate, forming extensive loose mats; flowers pink.

bunches of erect culms, sending out long prostrate creeping runners or stolons.
"ijoij"

shrub 1.5 m. tall, leaves salty astringent to taste; flowers white.

tree 6 m. tall, sterile at this season; said to be seedless variety. "nä"

33 5 684 Morinda citrifolia L. v
very common in open coconut groves
2 85 Nerium
planted in village
2 86 Crinum
abundantly planted in village

2 87 Sida fallax Walp. v
single plant planted in village
6 88 Phyllanthus niruri L. v
common locally in village
2 89 Plumeria rubra L.
planted in village

5 90 Pseuderanthemum carruthersii (Seem.) Guill. var. carruthersii
planted in village

4 91 Artocarpus altilis (Park.) Fosb. v
planted in ~~village~~ coconut grove
5 92 Thuarea involuta (Forst.) R. & S. v
common locally in coconut grove
6 93 Trumpetta procumbens Forst. v
~~abundant~~ plant locally in coconut grove
5 94 Cassytha filiformis L. v
common generally parasitizing herbs & shrubs

"mer" shrub 3 m. tall; leaves glossy; flowers white.
sterile shrub 3 m. tall.

neck up to 3 dm. high, 1-1.5 dm. thick, plant up to 2 m. tall; peduncles red, somewhat compressed; flowers white with maroon tube & stamens, very fragrant. Pedicels thick, 2-2.5 cm. long. "liep"
shrub 1 m. tall; leaves green; flowers orange. erect; flowers green.

rounded shrub or small tree 2.5 m. tall, flowers white with yellow center, fragrant.
small tree 3 m. tall; leaves green; flowers with salverform corolla; white with red-purple center, 2 lobes erect, one down, two lateral ones below horizontal.
tree 5 m. tall, sterile at this season; said to be seeded variety. "mā"
prostrate, forming loose mat. "ujoij" (means grass)
prostrate, extensive creeper branches ascending, flowers yellow. stems green (to yellow in some places), flowers white, fruit ~~brown~~ purple.

"uliij"

33695 Tacca leontopetaloides (L.) O.K. ✓
locally dominant in ground cover in sparse coconut grove. Seedlings abundant.

96 Premna obtusifolia R. Br. ✓
two trees seen, near village on lagoon side of inlet

97 Pandanus tectorius Park. ✓
common generally

Took samples of water flowing from beach in small springs just above low tide mark. This is salty. Also took water samples from two ~~of~~ pit wells, one about 100 m. from beach, other about 50 m. on lagoon side of island.
Two samples marked UW-6 and UW-7 are from beach, UW-6 taken at low tide, UW-7 1/2 hour later. UW-8 from 100 m. back of beach at this point; UW-9 from 50 m. back, but much further west.

98 ~~Algae~~
algal crust on soil in coconut grove.

acaulescent, scapose, up to 2 in. tall, at this season turning quite yellow; fruits ripe. Tubers used to make starch. "mokemok"
Seedling included in specimen.
small tree, leaves badly eaten by insects. Sterile. "kaar"
Tree 5 m. tall, pulp of fruit eaten. "bop".

~~Vial~~ Vial # 6 - bottom layer has damsel flies from around pit well, house flies that are everywhere.

Vial # 10 - miscellaneous. Elaterid flying to light at night - Utirik Islet. Pseudoscorpion, mite, and isopod in litter samples # 9+8 from Eekuk I.

1951 Marshall Is.

Bigarak

Dec. 2 - Pigarak I. sta. South part of islet planted to coconuts. This part has sandy a gravelly soil, upper layer black or at least fine material black. Ground cover mostly Lepturus.

Just east of the south point is a small mangrove depression with Bruguiera conjugata, water rather muddy because stirred up by pigs. Water sample UW-10 taken here.

No weeds or cultivated plants noted on this islet.

Outer part of island of sharp broken coral, pieces small on inner side, coarse on outer. Along concave ~~a~~ passage beach is a very well developed ridge of sharp broken rock not at all vegetated ~~on~~ the outer slope and on the broad (5-10 m.) top. Only one or two plants of Triumfetta have gained a foothold on the outer part of this, scarcely in a few places. Lepturus where sand has accumulated.

On outer reef there is evidence of a former reef (1m A.S.L.)

Eekuk Islet - coconuts sparsely planted on inner end of islet, with considerable Pandanus. Open ground under trees with Lepturus. Soil here relatively fine, but with considerable gravel sized material.

Remainder of islet covered with mixed scrub with Pisonia and Scaevola predominant, outer beach fringe with considerable Suriana, growing on cobble ridge. Small openings with Achyranthes abundant. Butterflies very common here visiting Achyranthes flowers.

Inside this is mixed scrub with considerable Pisonia. Between this and coconut grove is narrow open strip, grassy. Small Pisonia in scrub at inner edge.

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most of which has been cut away, but which still exists, to a height of 3-4 feet just under the boulder rampart.

The inner end, 1/4 a 1/3 of the concave passage beach, is of sand, and here is beach-rock, strike parallel with beach, dipping toward passage. The beach above this is of fine calcareous sand (sample 7 B). It is being blown away, exposing Scaevola roots. The only plants growing on the actual beach slope are a few scattered Tournefortia procumbens.

In this sand are occasional small pebbles of pumice, these in most cases completely enveloped in a casing of small Scaevola roots.

The general broken rock surface is covered by mixed scrub, largely Scaevola, but with Guettarda, Messerschmidia, Pisonia, and Terminalia samoensis. The secondary components become more abundant toward the outer end, but on the actual outer beach is a broad fringe

of mostly Scaevola, this only about 1 m. tall or less, while the general scrub is from 2 to 4 m. tall, with occasional trees, mostly Pisonia but some Messerschmidia and some Guettarda 5-7 m. tall.

Vial #8 - Misc. insects taken sweeping, mostly on Pigawak Islet
(Geophilid on Eerak Islet.)
(Cerambycid on Eebuk Islet)
(Lygeid on Pigawak I., on Adelphyllus.)
(Large moth larva on Pisonia on Eebuk Islet)

Vial #9 - Misc. animals collected in leaf litter on ground on Eebuk Islet.

Screening samples: Eebuk Islet:
#8 - from approx. 1 sq. yard of litter under Pandanus.
#9 - from approx. 1 sq. yard of surface in Leptecus grass under sparse coconut.
#10 - from approx. 1 sq. yard under Pisonia. Living termites in vial from decaying Pisonia twigs on ground

Dec. 2 - Eelulk Islet

33699 Tuiiana maritima L.
outer fringe of scrub on outer beach

33700 Ipomoea tuba (Schlecht.) Don
very abundant in south passage beach, on rubble and climbing over scrub.

01 Portulaca lutea ? Sol.
small colony on bare coral gravel near inner beach.

Dec. 2 - on reef flat in passage bet. Eelulk and Pigawah Islets.

02 alga Neomeris vanbosseae Howe (det. Taylor 1955)
very common at about extreme low tide level

03 Liagora? valida Harvey (det. Taylor 1955)
rare at about low tide level

04 Microdictyon okamurai Setch. (det. Taylor 1955)
rare at low tide level

05 alga Centroceras clavulatum (C. Ag.) Mont. (det. Taylor 1955)
on tufts of Caulerpa at extreme low tide level

06a Caulerpa serrulata (Forssk.) J. Ag. (det. Taylor 1955)
very common on bare rock at extreme low tide level

06b Caulerpa racemosa var. williana Mont. (det. Taylor 1955)

07 Dictyopteris
very common on tufts of Caulerpa at extreme low tide level

08 Porolithon gardineri (Foslie) Foslie (det. Taylor 1955)
living fragments on reef flat just below low tide level

low shrub 1 m. tall,
flowers yellow "ngienge"

prostrate and twining,
flowers white, calyx fleshy just before maturity "manalp"
(seeds coll. for Taylor)

stems up to 15 mm. thick,
gray brown, ascending;
leaves fleshy, obovate;
flowers yellow,
1 cm. across, stamens 15-20;
"purya"

whitish green, clavate-terete.

green

reddish.

prostrate rhizome with tufts of compressed green process.
yellowish red.

bright rose pink

1951 Marshall Is.

Bigarak

Dec. 2 Pigaiwak Islet

33709 algae (blue-green)
in cavity in fallen Pisonia trunk

5 10 Allophyllus timorensis (DC.) Bl.
colony in mixed scrub on broken coral

7 9, 11 Premna obtusifolia R.Br.
one plant seen in coconut grove

5 12 Bruguiera conjugata (L.) Merr.
small colony in low spot near south point. not seen elsewhere.

5 13 Terminalia samoensis Rech.
occasional in mixed scrub.

5 14 Achyranthes velutina H. & A.
~~small~~ two small colonies seen, (much more abundant on Lekuk I. in openings in scrub) in edges of scrub, on broken coral.

shrub 1 m. tall (others to 2 m.) diffusely branched, flowers white.

~~diffusely branched~~ shrubby tree 4 m. tall, branches to ground; flowers pale green, aromatic. Leaves varying in serration. small trees 2-3 m. tall; ~~flowers red~~ calyx red, petals tan. "chong"

shrub 1 m. tall (taller plants seen, also when on edge of beach, very depressed ones); fruit green.

spreading, sprawling plants, repeatedly branched, floral bracts bright purple.

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Utirik atoll

Dec. 3 Utirik) islet
sand spit with
low trees

3 3 715 Scaevola frutescens (Mill) Krause — shrub 2 m. tall, branched and spreading; flowers dirty white; fruit white, fleshy. "banana" white, fleshy.

2 16 ~~under bark~~ under bark of dead stub of living Messerschmidia

2 17 Laurencia sp. (det. Taylor 1955) floating in lagoon — red.

2 18 ~~algal layer~~ algal layer in surface layers of beach rock — green layer.

3 19 algal crust on coral sand — black, brittle into small blocks.

Vial # 11 - larvae of a moth, eating flowers and, to a less extent, leaves of Messerschmidia.

Vial # 12 - Miscellaneous insects collected on Messerschmidia argentea.

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several lines of beach rock dipping toward sea, then flat reef-rock, this quite impervious and hard except where cracked. Then one line dipping toward lagoon, then sand bar a spit a foot or two higher than reef rock. The rock apparently exposed during 1951 hurricane, which almost completely denuded this part of the islet.

The proximal part of this denuded ~~reef~~ rock flat has scattered clumps of Pemphis, some very dense with scattered tufts of Leptaurus between,

some Lasiythis and a few other plants. ~~Occ. distal spots~~ Dead bushes of Scaevola with their enormous root systems exposed are common on the proximal part, toward the sea, apparently killed by the March, 1951, typhoon, which swept much of the rock clear of soil.

Distal to a break in the beach-rock, where the sea comes in at high tide to form a large pool, there is almost no vegetation on the rock-flat (a plant or two of Pemphis, only), but a line of Scaevola scrub (with some Messerschmidia) runs on out along the crest
(3) of the sand spit. The bushes are well grown, 2-3 m. tall, and small trees of Messerschmidia may be 4 m.

along the lagoon side of this spit are two levels of deposited material, one just
(2) below the crest, fine level sand, with a slight algal crust, and beginning to be revegetated with Scaevola and Tephrosia. Between this and the water's edge is actual
(1) beach, of fine gravel, which is loose. Here are many tiny seedlings of Messerschmidia. All three of these belts are cut here and there by places where the waves have actually gone over and washed vertical sided gaps a foot or two into the sand ridge, exposing the root systems of Scaevola.

Counts of relative numbers of ~~roots~~ various plants present as seedlings & adult plants were made along a stretch that seemed typical. Areas were not measured, so the percentage composition is the only significant factor here.

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		1	2	3
general	Scaevola	3		21
general	Messerschmidia	118	131 3	5
general	Heptunus	13	95	
	~~Fimbristylis~~	~~Very~~	~~common~~	
local scattered	Fimbristylis			
rare	Suriana			
rare	Guettarda		11	
about 1 pan	Pandanus			
rare	Pemphis			
common	Cassytha			
scattered	Triumfetta		5	

The exposed beach rock has a green algal layer a few mm. below the surface, esp. where the rock is gray rather than white

Dec. 4 - Lagrm - saw white tailed tropic bird flying above boat.

Golden Plover seen generally on all islets. Very tame here, run with chickens. only fly up on close approach of a person. "kolej"

The coconuts, in general, are very small here, variable but averaging small.

Dec. 2 - Eelukl. - a great crowd of fairy terns in air when I was in bushy part of islet. The egg of one of them was seen lying on a dead stub of a branch of a Messerschmidia tree, balanced in a slight irregularity. It was mm. long, mm. wide, ground color a pale brownish gray, irregularly mottled with brown gray, brown, and very dark brown.

Hypolimnas bolina (:) very common here two main color forms and some variation in them. Visiting Achyranthes relating powers.

Native name for fairy tern is "mejo'k"

Large animals
Man "kanono"
Dog
Pig "big"
cat "guj"
chicken "pau" or "pau"
rat - reported by natives, not seen.

1951 Marshall Is.

Dec. 5 Taka I.

Lagoonward half in coconuts, more densely planted toward lagoon, sparser toward center of island (e. & w.).

Surface soil in part covered by coconuts, sandy, mostly not very dark in color except at extreme surface.

Profile # 11 in small grassy opening in this section.

Central part of island, scrub with a few scattered coconuts, and, in southern half, with open Pisonia forest. Profiles 12 & 13 in scrub, 13 in Scaevola, 12 in mixed Messerschmidia, Scaevola, Guettarda.

In coconut plantation scattered clumps and patches of Scaevola brush, masses of young coconuts, scattered Pandanus, ground cover of Triumfetta, Polypodium, Cassytha, Lepturus, very exuviant, the Triumfetta sending up erect branches

Sample 12-1

Profile # 12 0-4.3' three layers.

Layer 1. - A_1 horizon - 0-0.9' dark brown (7.5 YR - 3/2) but larger particles as light as 7.5 YR - 5½ in 6/2 F, at top becoming gradually darker. ~~and~~ ltr. loose granular, lighter, fluffier at top. Tex. loamy sand, more organic matter toward top.

changes gradually to

Sample 12-2

Layer 2 - A_2 horizon. pinkish gray (7.5 YR - 6/2) 0.9 - 1.5'
ltr. fairly compact but easily crumbled.
Tex. sand mixed with fine silt.

changes gradually to

(over)

Marshall Is. Taka atoll, Taka I.

Dec. 5, 1951 mixed grassy opening in scrub.

from the prostrate stems, abundantly floriferous, flowers opening late in afternoon. Cassytha forms large dense mats.

Well in this section - water temp. 81° at 10:35 a.m.

Outer third of island uneven mixed scrub, with grassy openings in north part, dense in south part, many fallen trees.

sample 12-3

Layer 3 C horizon. 1.5'-4.3'. pinks (7.5YR-7/4) str. loose varying to compact granular.
Tex. sand to small gravel with occasional fragments 2-4" across.
Resting on a smooth, very ~~hard~~ hard flat indurated lime-sand or beach rock (rings when struck with pick and sends showers of sparks)

Profile #11 of three layers, totaling 3' to rock.

sample 11-1

Layer 1 0-0.8' whitish pink (7.5YR-8/2), slightly stained with organic matter in upper 0.1'.
Str. loose granular
Tex. coarse sandy.

sample 11-2

abrupt change to
Layer 2. 0.8-1.5' salt & pepper mixture of dark brown (7.5YR-3/2) and pinkish gray (7.5YR-6/2).
Str. loose granular, many coconut roots.
Tex. very sandy loam.
This is certainly a buried A horizon.
transition of 1" to (ave.)

Marshall Is., Taka atoll, Taka I.
100 yards in from lagoon beach near center of island.
~~Oct~~ Dec. 5, 1951 sparse coconut grove, small grassy opening.

a few scattered coconuts, and, in southern half, with open Pisonia forest. Profiles 12 & 13 in scrub, 13 in beach, 14 in mixed Messerschmidia, Scaevola, Guettarda.

In coconut plantation scattered clumps and patches of Scaevola brush, masses of young coconuts, scattered Pandanus, ground cover of Triumfetta, Polypodium, Cassytha, Lepturus, very exuviant, the Triumfetta sending up erect branches from the prostrate stems, abundantly floriferous, flowers opening late in afternoon. Cassytha forms large dense mats.

Well in this section - water temp. 81° at 10:35 a.m.

Outer third of island uneven mixed scrub, with grassy openings in north part, dense in south part, many fallen trees.

Layer 4
st
Tex.

sample 13-4

2.5 - 4.4' very pale brown
(10YR - 8/4)
granular, loose,
coarse sand with some
gravel, changing to sand
and large fragments in
bottom 8" or so.

Resting on consolidated fine gravel.

nuts, and, in southern
half, with open Pisonia
forest. Profiles 12 & 13
in scrub, 13 in Scaevola
12 in mixed Messerschmidia,
Scaevola, Guettarda.

In coconut plantation scattered
clumps and patches of
Scaevola brush, masses of
young coconuts, scattered
Pandanus, ground cover of
Triumfetta, Polypodium,
Cassytha, Lepturus, very
luxuriant, the Triumfetta
sending up erect branches

Taka Atoll

Vial #13 - orb weaving spiders
from Taka Islet.

Vial #14 - animals from
around base of coconut
tree in pile of old leaves,
etc.

Vial #15 - ants and termites
from rotting Messerschmidia
log. Larvae in tubes
from outside of sheaths
of living coconut trees.
Other things miscellaneous.

from the prostrate stems,
abundantly floriferous,
flowers opening late in
afternoon. Cassytha
forms large dense
mats.

Well in this section - water
temp. 81° at 10:35 a.m.

Outer third of island
uneven mixed scrub, with
grassy openings in north part,
dense in south part, many
fallen trees.

1951 Marshall Is.

Dec. 5 – Taka Islet
Open coconut grove on coral sand soil.

33720 Scaevola frutescens (Mill.) Kr. ✓
5 " common under coconuts

5 21 Triumfetta procumbens Forst. ✓
very common, forming large pure stands under coconuts.

5 22 Messerschmidia argentea (L.) Johns. ✓
very common in scrub and under coconut trees.

5 23 Polypodium scolopendria Burm. f ✓
abundant everywhere under coconut trees

5 24 Cassytha filiformis L. ✓
very abundant everywhere on low growing plants.

5 25 Pandanus tectorius Park. ✓
common under coconuts

5 26 Lida fallax Walp. ✓
occasional to common under coconuts

5 27 Albugo platensis
common, parasitic on Boerhavia diffusa.

3 28 [illegible]
on dead coconut trunk

shrub 2–3 m. tall, forming rounded masses, leaves bright green, flowers dull white, inside of tube yellowish, edges of split purple; fruit white.
— main stems prostrate, flowering branches erect, flowers yellow, closed during middle of day, open in late afternoon.
— shrub 3 m. tall, others seen taller; leaves fleshy green, flowers white, fragrant.
— rhizome prostrate, fronds erect.

green to orange; flowers white; fruit immature.

small tree 6 m. tall.

shrub up to 0.3 m. tall, flowers orange.

causes branches of host to assume erect habit.

variable in outline.

5 33779 Achyranthes velutina H.&A. ✓
common in openings

5 30 Polyporus
on dead Pandanus tree

3 31 fungus
on dead Pandanus tree

5 32 Leptaena repens (Forst.) R. Br. ✓
dominant in many
places in openings, under
trees, and under scrub.

5 33 blue-green
in edge of coconut grove
on coral sand.

Dec. 6 same.

4 34 Morinda citrifolia L. ✓
occasional in Pisonia
grove, center of island.

2 35 Pisonia grandis R. Br. ✓
occasional all over island,
~~large~~ grove of large
trees in center, with
innumerable root sprouts

– 36 Carica papaya L. ✓
occasional in Pisonia
grove in center of island

5 37 Fimbristylis cymosa R. Br.
only a small colony seen
on S.W. corner of island

sprawling herb, up
to 1.5' m. across; flowers
rose purple.
bright orange-vermillion

erect tufts

black crust on surface of sand.

shrub 3 m. tall; leaves
glossy, dark green;
flowers white, fruit
ovoid, fleshy.
– trees to ~~50~~ 20 m. tall,
large soft white
trunks; all seen
were sterile.

single stemmed
tree. leaves in a
rosette at top, axis
somewhat elongate;
– ♀ flowers white.
small tufts, leaves
stiff.

1951 Marshall Is.

3 3 7 3 8 2		Suriana maritima L. ✓ very rare, few plants on top of s.s. beach	low shrub 3 dm. tall, all seen sterile.
2	39	Terminalia samoensis Rich. ✓ single plant on exposed beach	shrub 1 m. tall, sterile.
5	40	Guettarda speciosa L. ✓ very common in scrub and occasional in coconut grove.	small tree 3 m. tall, ~~flow~~ (others taller) flowers white, very fragrant. produces erect habit in infected branches of normally prostate host.
5	41	Albuga platensis common, infecting Boerhavia	fleshy much branched spreading to ascending herb, stems red; flowers yellow, stamens
5	42	Portulaca lutea Sol. occasional on typhon-stiffened flat facing sea, on bare sand.	prostate, forming extensive mat, from thick vertical root; flowers pink, stamens 2-3.
5	43	Boerhavia diffusa L. in sparse coconut grove near north end, on broken coral.	erect, stem fleshy, orange; flowers orange. shrub 2 m. tall, with seedlings beneath.
5	44	Fleurya ruderalis Gaud. ✓ abundant in sparse coconut grove, on broken coral (also on sand).	prostate, from thickened roots; flowers pink, 2-4 stamens.
2	45	Morinda citrifolia L. ✓ on broken coral in north end of coconut grove	
5	46	Boerhavia ~~sp~~ at edge of scrub at north end of island, exposed situation.	

1951 Marshall Is.

33747 Pemphis acidula Forst. beach-rock stripped of loose material by typhoon.

48 Boerhavia in edge of scrub at north end of island.

49 on rotting coconut wood

50 on rotting wood.

Vial #16 - animals from under loose bark of rotting Pisonia twigs.

Vial #17 - animals from axils of ~~Pa~~ Pandanus leaves.

Vial 18 - snails from old coniferous log cast up above high tide mark on seaward beach.

Vial 19 - insects, etc. from leaf mold, etc. on ground

old stubs, left by typhoon, sending out clumps of sprouts. leaves thick, astringent when chewed; petals white; top of fruit maroon. Prostrate, forming large loose mat; flowers pink, stamens 2-3.

whitish in color, ~~including~~ gills.

tan color with somewhat darker gills.

Dec. 7 - ~~#~~ same

33751 Digitaria microbachne (Presl) Henr.
#4 small colony on broken coral in north end of coconut grove.

The greater part of Taka Islet is characterized by sandy soil, ranging from almost unaltered at the surface to black and filled with humus. The surface is generally covered by scattered small coral fragments and occasional cobbles and boulders. The soils are deep and profiles vary, there being usually buried profiles. In the center of the north end of the island, about 100-150 m. in from all three sides is an area, planted to coconuts of broken coral, the fragments varying locally in size from 2-4 cm. thick to cobbles and even small boulders.

In the Pisonia grove in the center the soil is black, boulders fairly numerous. Here are a

plants weak, supported by surrounding vegetation.

few plants of Carica papaya. Many Pisonia trees have been knocked down by the typhoon, and the grove is open, but choked with seedlings and sprouts 1-3 m. tall. The trees are up to perhaps 60 ft. high, now quite scraggly and with leaves badly eaten by larvae.

1951 Marshall Is.

Lujiion

Dec. 7 - Raajerun Island

33752 Suriana maritima L. scattered bushes on sand bar, the one specimen came from growing on exposed beach rock.

soil sample #14 - a peat forming a tough, compact layer 2.5 - 3" thick ~~and~~ underlain by loose coral gravel with very little sand. Color dark brown. pH 5.5-6.0. In Pisonia grove.

soil sample #15 - black to dark brown layer, with some foraminifera and coal fragments, 3" thick overlying loose coral gravel. in Pisonia grove. pH 8.0 more crumbly than #14.

screening sample #16. material scraped from surface under dead leaves in Pisonia grove, on layer from which soil sample #15 was taken, run thru 2 screens, caught on fourth.

Bay sample X - cemented coral reef flat just above high tide level.

bush 2.4 m. tall, spreading, much-branched.

On the reef flat on the north side, exposed at medium to low tide, the reef-rock surface is flat with micro-solution features, pointed enough to preclude there being extensive abrasion in process at present. Tiny solution basins stained white in places with precipitated chalk (?) [photo]. On this flat there is horizontal exfoliation taking place, right through corals and other irregular materials, giving smooth flat surfaces, which then start to be pitted again. Several stages of pitting visible in adjacent segments, showing relative times of exfoliation [photo]. The material is a hard, very much consolidated breccia or conglomerate material. (over)

1951 Marshall Is.

Vial #20 insects caught beating Lida pallax

Vial #21 animals collected in leaf mould ~~under~~ in Pisonia grove. Isopods generally common, but great concentration under one coral boulder. Tornatellinids on decaying Pisonia twigs. Pupillids loose in soil.

Temp. of very small pools at 9:20 a.m. is 84° F., of dry rock adjacent 85° F.

The inner beach is lined with tall Scaevola scrub with some Messerschmidia. The north passage beach with ~~Messerschmidia~~ wind-beaten Scaevola scrub with Terminalia, Guettarda. The outer beach has an extensive bare stripped area, then, on sandy flat a belt of Leptenus-Portulaca with Portulaca more abundant on the outer edge, on extreme outer edge many Portulaca seedlings only, inner part with scattered shrubs

of Scaevola and Messerschmidia, then a belt of low Pisonia scrub (gradually merging around passage beaches into Scaevola scrub of inner beach. This belt giving way to Pisonia grove which occupies center of islet. This is an area of two in extent. Trees wind-sheared to about 6-8 m., trunks 3-4 dm. or less thick, tops forming a fairly complete canopy, still green but beginning to lose leaves in places. Spacing averages 3-4 m., no undergrowth except occasional Pisonia seedlings or sprouts, except in openings left by fallen trees, which are choked with sprouts. Ground in grove covered by decayed twigs. Soil black, in some places pure tough peat, (sample #14), pH 5.5-6, 5-8 ~~dm~~ cm. thick, in other places with some admixture of pebbles, sand, etc. (sample #15), pH 8, always shallow, underlain by loose coral gravel; cobbles + boulders scattered on surface. Pisonia root systems spreading just under surface, no (p. 85)

1951 Marshall Is.

Lajeran

Dec. 7 - Passage bet. Raajeruu and Taka Islets.

At low tide there is a current of water a few inches deep flowing into the lagoon. The rock surface is pitted with solution (?) basins a few inches across, each with a handful of gravel in it, which has evidently pot-holed the basins to a more or less hemispherical shape. The rims are elevated a fraction of an inch above the surrounding flattish surface.

33753		Dictyosphaeria cavernosa (Forssk.) Børg. on boulder on reef flat	(det. Taylor 1955) green.
1			
6	54	Cladophora or Spermothamnion (det. Taylor lining interior of solution basins	1955) yellow felt, binding fine sand.
2	55	? Valoniopsis pachynema (Mart.) Børg. in depressions in reef	(det. Taylor 1955) pale green, very coarse mat.
1	56	Microdictyon okamurai Setch. (det. Taylor on pebbles and cobbles on reef flat	1955) green, in one plane.
5	57	on reef flat outside of islet	holding fine sand or silt in a pulpy-like mass, reddish-pink on surface, greenish within.
2	58		rose-pink. This coating
2	59	on pebbles & pieces of coral on reef	on rocks. flat in pot-holes.

Taka atoll
from p. 83

pronounced tap roots. A few trees tipped over by typhoon. Openings around edges have birds and echinanthes, separately, each forming low scrub, locally, in them, but openings mainly Lepturus.

Temperatures at noon in grove 1 m. alt. 96°F., close to boulders 84.5°F., ground level 83°F.

Terns abundant, esp. fairy terns - nesting.

Noddies & Sooties also present.

A ne bristle-thighed Curlew sen.

33760
3

on Lambis shell on reef

Walkworth

Dec. 9 - Eluk Islet

Bag sample #14 contains screenings from surface layer in Messerschmidia scrub - Pupillidae and perhaps other snails. also sub-fossil marine echinoids.

Vial 22 - insects secured sweeping Leptinus vepens.

Vial 23 animals secured around roots of Leptinus.

Vial 24 insects secured sweeping Fleurya inderalis.

Vial 25 animals from under Messerschmidia bark.

Vial 26 Earthworms from under rotting coconut log.

Vial 27 Grasshoppers from grassy openings, common. Geophilids, larvae, etc. from under Pisonia.

red filaments, giving surface a slimy feel.

Jar #3 contains hermit crabs found up between stilt roots of Pandanus and a skink, from Taka Islet, Taka atoll. a land crab found under a boulder on Raajeruu Islet in Pisonia grove, skink (wrapped in cloth) from same place; hermit crab from Lambis shell on reef between Taka and Raajeruu Islets, below low tide level; land crab found under rotting coconut log, and gecko found under loose bark of dead Messerschmidia tree, on Eluk Islet.

The land crab from Raajeruu was generally dark purple, the one from Eluk gray-brown, appendages banded with lighter gray.

sparse Mezzerschmidia
scrub with openings

3 33761 Boerhavia
on broken rock in opening in
~~61 Boerhavia~~ also on coral gravel
~~on broken coral rock in opening~~

9 62 Boerhavia x?
on broken coral rock in opening
also on coral gravel.

4 63 ~~Boerh~~ albugo platensis
infecting Boerhavia #33762

1 64 Flemya rudenalis Card. ✓
abundant in openings
especially on broken
rock, but also on gravel,
rarely on logs or
sloping tree trunks.

5 65 Boerhavia
common in opening
and at edges, on broken
coral and coral gravel.

prostrate, leaves thick,
white beneath, stems
scarcely reddish; flowers
pink. Plant infected
with albugo.
prostrate; leaves
thick, ~~stems~~ white
beneath, stems reddish.
~~not much~~ infected
with albugo.
altering habit of
infected branches from
elongate, prostrate,
to erect, short,
erect, stems fleshy
green, no red color.
(green dominant
color on this islet,
very little trace of
red & bronze seen).
prostrate, stems
reddish; leaves
scarcely thick, white
beneath. Flowers pink.
Not infected by albugo.

on seaward reef on south-west corner of islet

33766 on
1 on clump of Porolithon, down in crack on outer edge of reef flat, back of lithothamnion ridge

1 67 Caulerpa urvilliana Mont.? (det. Taylor 1955) green

same. rose pink, paler at tips.

3 68 Porolithon
on outer reef flat, among living coral back of lithothamnion ridge

3 69 Porolithon same

3 70 alga growing on Porolithon pale pink

2 71 alga Myxophyceae incl.-? Phormidium forming thin pan on rock on inner half of reef flat between tides, holding fine sand (det. Taylor 1955) reddish.

2a. 72 Porolithon
73 Porolithon gardineri (Foslie) Foslie f. gardineri det. Doty bright rose-pink.
74 Porolithon
75 ~~Porolithon~~ A Goniolithon sp. E Porolithon sp.
76 ~~Porolithon~~ making up massive part of Lithothamnion ridge

77 alga growing on ~~tabular~~ Porolithon finnish-white.

78 Lichen on bank of Mesenchymidia, in sand

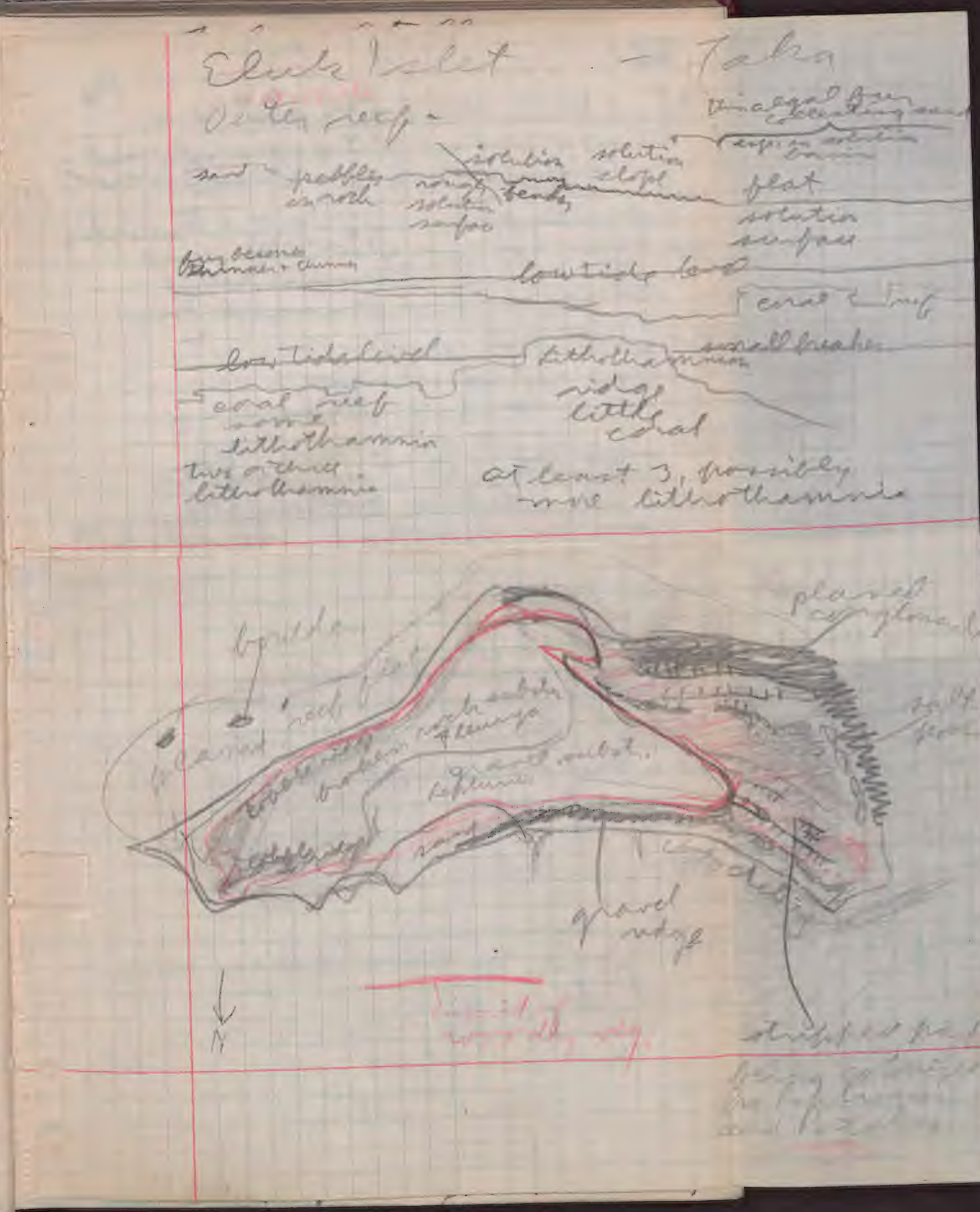
dark red.

1951 Marshall Is.

Wotmeluk

Gluck Islet is about three fourths covered with rather sparse Messerschmidia scrub, with some tree-vols especially along outer beach, scattered low scraggly Pisonias in interior, the scrub in places quite dense and tangled with fallen trees, in places open and with irregular openings. The southwest 1/4 was stripped bare by a typhoon, leaving in most places a thin gravel, with rock exposed in many places (see diagram). This gravel being colonized by Lepturus and Portulaca.

The wooded part of the islet is several feet higher than the denuded part. The southeast part is broken rock surrounded by a low ridge or rampart, the rock varying in size from small pieces 3-5 cm. thick to cobbles, more or less uniform locally, boulders scattered here and there; incl. large slabs of beach-rock far inland.



Elwk Islet is about three fourths covered with rather sparse Messerschmidia scrub, with some Scaevola especially along outer beach, scattered low scraggly Pisonias in interior, the scrub in places quite dense and tangled with fallen trees, in places open and with irregular openings. The southwest [illegible] stripped bare

one not seen [illegible] beach.

3 geckos and some eggs seen under bark of dead Messerschmidia but not caught. Skinks seen but not caught. one

One housefly and one bluebottle fly seen but not caught.

Otherwise no flies (of these sorts) seen on Taka atoll.

thin A horizon here and there in gravelly part of islet, filled with roots, or under Pisonia, peaty

Elwk Islet — Taka

Outer reef —

some Boerhavia mats, occasional Portulaca, no Lepturus except very locally in sand spots; much bare broken rock.

The inner beach, opposite the gravel part backed by a low gravel ridge. The lagoon side of island has scrub much damaged by typhoon, with many fallen or broken trees, all pointing southwest, many open places, some in center very sandy; these openings in various

Beach rock almost surrounds
this islet - planed away on s.e.
corner to an even surface exposed
at medium tide. Ends of these covered
by seaward ridge; loose material mostly
West end (loose material)
slipped off. Several lines of
beach-rock both inward and
outward dipping.
Rubble deposit in lagoon opposite
the end and extending some distance
eastward.
Eastern passage coast piles
with cobbles, also half way
along seaward coast, to point
3 m. above h.t. no sand. Also 1/4 way along lagoon beach
Lagoon beach back of beach rock
has a gravel ridge with sand.

...midge but ~~not~~ caught.
seen but not caught

...sefly and one bluebottle
seen but not caught.

...wise no flies (of these sorts)

on Taka atoll.

...ges here and there on gravelly
...at, filled with roots.
Pisonia, peaty.

The Messerschmidia
is mostly 2-3 m. tall,
with scattered trees
to 5 or 6 m. The Pisonia
is mostly in the central
and eastern part, the
Scaevola mostly in
the western, sandier part.
The openings in the
gravelly part have
Lepturus, Portulaca, and
Fleurya, the latter
forming dense clumps
and patches, with
Boerhavia mats.
The openings in the rocky
part have principally
Fleurya stands,
some Boerhavia mats,
occasional Portulaca,
no Lepturus except very
locally in sand spots;
much bare broken rock.
The inner beach, opposite
the gravel part backed by
a low gravel ridge. The
lagoon side of island
has scrub much
damaged by typhoon,
with many fallen
or broken trees, all pointing
southwest; many open places,
some in center very sandy;
these openings in various

stages of colonization by Lepturus and Portulaca, from abundant seedlings to almost closed bunchgrass.

Many fallen trees in scrub, mostly fallen ~~south~~ southwestward.

Total flora (as far as observed)
Messerschmidia argentea
Lepturus repens
Fleurya ruderalis
Scaevola frutescens
Portulaca lutea
Boerhavia diffusa
Boerhavia tetrandra
Albugo platensis
Pisonia grandis
Cocos nucifera (4 plants)
Triumfetta procumbens (1 pl.)
(one plant on lagoon beach)

Most of day thinly overcast occasional clouds, gentle trade-wind breeze.
Noon temperatures:
ground level in shade 92°F. & 91°F.
1 m. high in shade 86°F.
1 m. high in sun 88°, 89°F
varies with brightness of sun and changes of strength of wind.
Clouded over at about 4 p.m., breeze freshened, showers in distance.

at 5:15 p.m. temperature
1 m. from ground 82.5°F.
on ground 83.5°F.
during a light shower temp. dropped to 77.5°F., after shower rose to 79°F. dropped to 78.5°, then rose to 81°.
At 7:10 p.m. it was 81°F
At 7 a.m. (Dec. 10) it was 81°F.

This islet is one vast tern rookery, with thousands of sooty terns, many Noddies (prob. both species) and great numbers of fairy terns, all nesting.

Gygis alba lays eggs on bare branches wherever there is a knot-hole or slight irregularity, scattered generally over island, young in various stages.

Noddies make nests of sticks and leaves, in trees and on ground on open pebble flats on east end of island, in trees generally over island. Larger brownish bird mostly seen in trees and on ground, smaller blackish one with

a. stolidus
a. tenuirostris

white crown in trees.
Eggs light colored, only lightly speckled.
Sooty terns ~~[illegible]~~ gregarious on seaward side of atoll, ground locally blackened with them, the ground under the seaward row of Messerschmidia bushes scattered with their eggs, laid on gravel & sand with absolutely no nest. Eggs variously colored from grayish to brownish, variously mottled and speckled with brown & dark brown.
When approached these birds rise with deafening clamor by thousands.
Camped on lagoon side - at about 6:30 P.M. great horde of sooty terns came circling over camp, screaming and squawking, and kept this up continuously till after 7 a.m.
One flock of turnstones on w. end of island on reef flat and rubble bars.
Three Sula leucogaster seen flying over lagoon at 8:30 a.m. (only ones seen at Taka).

Taka - general.
No flies seen here (except 1 on Elut which may have come with us.)
One mosquito (Aedes sp.?) seen on Taka islet.
No frigate birds, no plovers.
Flora sparse - no Tournefortia, no Ipomoea, no weeds, no Euphorbia, no Allophylus, no Calophyllum, little Suriana.

Vial 66 - material collected by Berlese funnel from leaf-mold from under Pisonia trees, Elut I.
Jaluit I.

Dec. 11 anchored in lagoon
11 p.m. wet bulb 28°C. dry 28.5°C.
(this wet bulb figure may be unreliable)

Dec. 12 anchored in lagoon
9 a.m. wet bulb 26°C dry 27.5°C.
sunny with moderate cumulus clouds, moderate trade wind breeze.

Lato

Dec. 12 Lado Islet
4 p.m. wet bulb 27°C. dry 29°C.
sunny, clear blue sky except for clouds around horizon (up to 30°)
moderate trade wind breeze.

~~11~~. 11:50 p.m. almost clear sky, light breeze.
wet bulb 25.3°C, dry 26.5°C.
leeward beach and passage lined with dense scrub composed mainly of Scaevola, Terminalia, and Guettarda

Dec. 13 8:15 a.m. almost clear sky, light breeze
wet bulb 25.8°C. dry 27°C.
12:05 p.m. slightly more cloudy but still mainly blue sky, breeze slightly stronger
wet bulb 27.6°C. dry 29°C.

Lato

Dec. 12 - Lado Islet -
outer reef, low tide, moonlight.
reef flat almost devoid of life. - several small fish, two spiny lobsters.
Lithothamnion ridge has large pencil-spine sea urchins in somewhat sheltered places.
A spectacular species of Porolithon very common, colonies spherical, up to size of human head or closely packed cylindric branches.

forms Pandanus and Ochrosia.
Cardinal passage beach.

3:10 p.m. same
wet bulb 26°C. dry 28°C.

10:05 p.m. sky almost cloudless breeze very slight
wet bulb 25.3°C. dry 26.5°C.

Dec. 12 Likiep Islet
coconut plantation west
of village

33779 s on ground in path.

s 80 on base of coconut tree

s 81 on wet earth in small taro pit.

Dec. 12 Lado Islet
scrub on passage and ~~beach~~ outer beaches.

s 82 Ochrosia oppositifolia (Lam.) K. Schum. v
rare, in interior of scrub

small tree 5-6 m. tall,
milky sap, flowers
white, very fragrant.
fruit green, old ones under tree.

v 83 Terminalia samoensis Rech. v
common on outer edge of scrub

shrubs 1-2 m. tall; leaves
leathery; flowers fragrant;
fruit immature (fl. & fr. from
different plants).

v 84 Cordia subcordata Lam. v
occasional along passage beach

large rounded spreading
tree with dense branching
reaching to ground, making
a small thicket of one tree;
flowers orange; fruit dry,
black, when ripe.

1 85 Barringtonia asiatica (L.) Kurz
drift fruit picked up on
outer beach, no trees
seen.

must have drifted a long time,
judging from worn appearance
and growth of Lyngbya on surface.

s 86 Cladophora sp. + Polysiphonia (det. Taylor 1955)
abundant in beach drift
at high tide marks

green

1951 Marshall Is.

33787 Polyporus cinnabarinus
on dead pandanus trunk

88 Suriana maritima. ✓
one plant in edge of beach scrub
on outer beach

Dec. 13 - Lado Islet, southend
open coconut grove, with
grassy ground cover.

89 Polypodium scolopendria Burm. ✓
common, especially under
trees

90 Digitaria microbachne (Presl) Henr. ✓
common, dominant locally

91 Eragrostis amabilis (L.) W. & A. ✓
very common locally

92 Hedyotis biflora (L.) Lam. ✓
local patches

93 Euphorbia chamissonis Boiss. ✓
one large colony seen

94 Fleurya ruderalis Gaud. ✓
common, especially on
patches of broken coral rock

Vial #29 ~~Ostracoda~~ copepods from
salt water at edge of passage
beach at extreme low tide.
(in separate box, ~~for C. Waite.~~)

bright vermillion.

mud, branched
large, bush 2.5 m. tall,
wet with salt spray;
flowers yellow.

rhizome horizontal,
usually buried; fronds
erect, series of intergrades
- from fertile to sterile fronds.
culms weak but ascending.

spreading tufts.

prostrate, somewhat
malodorous when broken;
flowers white, corolla tube
- globose, lobes little spreading
stems ascending
sap milky; floral
- glands greenish.
stems fleshy, red.

1951 ~~Ailuk Atoll~~ Marshall Is.

Dec. 13 - Lado (Late) Islet, south end

Inner third of south hook of islet extremely barren in appearance, sparse Lepturus, Fimbristylis, Triumfetta, etc. only luxuriance seen under Pandanus & guettarda trees, where seedlings very abundant. Cassytha mats here very sparse and yellow.

Soil Profile #17 taken here, also water sample LW-2.

This hole is 175' north of passage beach and 221' east of lagoon beach. At 1:30 p.m. water was struck at 5.5'. The hole was dug perhaps 0.5' deeper, in same material.

The profile has 3 layers.

Layer 1 - 0-0.6', is of fine reddish gray (5YR-5/2) sand under a pebbly surface, with much pebbly coral in it, structure friable fairly compact. texture - fine sand with pebbles. ~~Layer 2 0.6-3.0'~~. grass roots and some coconut roots

sample 17-1

Layer 2 - 0.6-3.0' pinkish white to pink (5YR-8/2-8/3), some lenses stained slightly grayish.

sparse coconut grove with some Pandanus & guettarda.

structure loose; granular. texture sand of varying fineness, sorted somewhat in lenses, with many water-worn pebbles and cobbles, mostly somewhat flattened, arranged horizontally. Some coconut roots.

sample 17-2

3.0-6.0';

Layer 3 - white to pink (5YR-8/1, 8/2, 8/3) in a granular mixture.

structure ~~fine~~ very loose.

texture fine gravel with pebbles up to several inches across.

sample 17-3

Water at 5.5' (at 1:30 p.m.)

sample LW-2.

84° F. hydrometer sp. gr. 0.9992±1. milky in appearance, tastes perfectly good.

by 5:30 p.m. water level had risen to 3.9'

by 10:30 p.m. it had disappeared completely.

8:40 next morning 4.7'

Vial #29 - animals from surface of ground in this sparse barren area. incl. 2 sp. ants. several shells that the large ants were carrying.

The center third is a transition to the outer third.

The outer third is also coconut plantation, but not so sparse. Perhaps crown cover 40-50%. Ground cover is mostly complete except in local areas of mounds of broken coral rock (small pieces) with no sand, where Fleurya becomes abundant, though mostly quite dwarfed. Otherwise the background is a mixture of Lepturus, Digitaria and Fimbristylis, locally varying in proportions. The soil here is black, less rocky.

There are large colonies of Wedelia and of Euphorbia chamissonis, smaller ones of Eragrostis amabilis, and especially of Polypodium scolopendria. Small patches of Hedyotis biflora very dense.

Vial 30 - insects caught sweeping the grassy ground cover.

Water sample LW-1 is from an abandoned well in this area, with little water but at least 1' of soft muck in bottom, old coconuts, leaves, etc. Strong odor of H_2S.

Sample taken at 8:40 a.m.

79°F. hydrometer sp. gr. 0.9982

Well unceased, at lowest point in general land surface but no depression to speak of.

This type of vegetation makes up almost the entire main body of the islet, with scrub forest belt along entire seaward beach, with belt of Wedelia just back of it, this varying greatly in width, apparently due to vicissitudes in clearing it out. much burning.

Low mounds of broken coral scattered along entire seaward side of islet in coconut grove. Fleurya grows on these. apparently in such places only does it compete successfully with general ground cover.

Dec. 14 Sado Islet
6:10 p. m. wet 24.7°C dry 26.5°
calm scattered clouds.

Vial 31 - beetles in ripe head of Pandanus fruit. (Drosophilids seen also but not any)
Vial 32 - bees - leaf-cutters entering and leaving holes in old drift-wood log on outer beach.
Grasshoppers - common in grassy ground
Earwigs in coconut grove.

In south half of island are two longitudinal depressions perhaps 1-1.5 m. below general level of island. Grass fairly luxuriant here. One just back of seaward ridge on s. end.
Soil profile #18 taken here.
Layer 1-A horizon - 0.-1.3' black to dark reddish Brown or very dark gray (5YR-2/1-2/2-3/1)
str. loose granular
tex. coarse sand and silt (?) with much coarse gravel. Grass roots at top, coconut roots in bottom. Sample 18-1.
gradual transition over several inches to layer 2.

Layer 2 - 1.3'-2.5' pinkish (7.5YR-8/4)
str. loose granular
tex. coarse foraminiferal sand with embedded coral fragments up to several inches.
few coconut roots.
abrupt transition to layer 3.

Layer 3 - 2.5-3.9' (+ hole not dug deeper) water at 3.5'
str. loose.
tex. fine gravel, little included coarse material, practically no roots.
Water sample LW-2.
tastes very fresh.
Taken at 1:13 p.m. 86°F (had stood an hour or so after digging finished)
sp. gr. hydrometer 0.9974 at 87°F.
air temp. 91.5°F in shade.

Dec. 14 - Kads Islet
seaward reef, near south end of islet
Reef flat of solution pitted rock sloping very gradually from front of seaward lipping beach rock beds.
Rock covered almost everywhere with a felt of algae, rather loose, collecting and holding sand
Outer half of this has circular mushroom-like coral, alive around edges (Porites?), these becoming abundant near outer edge. Whole reef possibly 150-200 m. wide

Reef flat, seaward reef.

33795 Caulerpa urvilliana Mont. (det. Taylor 1955)
5 fairly common, in full sun — green, turning yellowish, creeping, adhering closely & roots bitten.

1 96 Cladophora sp. (det. Taylor 1955)
tangled with other fine reds — outer part

1 97 Valonia? ocellata? juvenile? (det. Taylor 1955)
tangled with other algae on outer part. — green, cells very large.

1 98 Udotea indica A. and E. S. Gepp (det. Taylor 1955)
with other small algae — tangled with Caulerpa — green, opaque.

outer 10-15 m. is a ridge, up to 1.5 m. higher than bottom of flat behind it, of several species of coralline algae, mainly of compactly branching head-like types, light rose-purple color; ridge very irregular, cut by deep surge channels.
Just behind this are jagged remnants of a higher reef surface, up to 1 m. or even more above flat.

33799 Laurencia? perforata (Bory) Mont. (det. Taylor 1955) small pink tufts.
5 common on outermost part of
33800 Microdictyon okamurai Setch. (det. Taylor 1955) flattened, curved, often
5 occasional on middle part of net-like; green.
5 01 Liagora (det. Taylor 1955)
occasional on outer part of
02 red Centroceras clavulatum (C.Ag.) Mont. (det. Taylor 1955)
and Polysiphonia
common on tufts of Laurencia, reddish tufts. (prob.
Caulerpa, etc. near more than one species
outer edge of involved).
5 {03 red alga
5 {04 green alga } Centroceras; Cladophora (det. Taylor 1955) — possibly not growing
forming loose felt on mixed but mixed
reef flat, holding sand. in collecting pail.
on Lithothamnion ridge
1 05 ~~Dict~~ Dictyosphaeria sp. (det. Taylor 1955) bluish green
in interstices of Porolithon
3 06 Dictyosphaeria ? cavernosa juvenile? (det. Taylor 1955) green, cells large.
on clumps of Porolithon turgid.
3 07 Laurencia? perforata (Bory) Mont. (det. Taylor 1955) dark red, terete.
on clumps of Porolithon
3 08 brown alga Pocockiella variegata Lamx Papenf (det. Taylor 1955) forming yellow-brown
on clumps of Porolithon skin over Porolithon, closely
adherent, like paint.

~~5~~ middle part of reef flat
5 09
forming felt on loose cobble
collecting sand

on Lithothamnion ridge

5/33810 Porolithon craspedium (Foslie) Foslie det. Doty
5 11 Porolithon onkodes (Heyd.) Foslie det. Doty (with goniolithon spp.) goniolithon sp. 33811 ○ 7 [illegible]
1 12 ~~Porolithon~~ goniolithon frutescens Foslie
5 13 ~~Porolithon~~ goniolithon sp.
1 14 ~~Porolithon~~ goniolithon frutescens Foslie
8 15 Porolithon

(33810, 11, 13 from landward side of ridge, 33812, 14, 15 from further out)

Dec. 14 Lado Islet, south end in coconut grove, dry sparse aspect.

~~16 at foot of a~~

2 16 ~~alga?~~
at foot of old coconut tree, on soil.

5 17 ~~[illegible]~~
common, forming crust on soil, cracking and curling up in dry weather

moister, more grassy aspect, toward outer beach

5 18 Pandanus tectorius Park.
scattered in coconut grove

5 19 Wedelia biflora (L.) D.C.
large patches, especially along inner edge of scrub belt of seaward ridge.

3 20 Crinum pedunculatum R. Br.
planted and spontaneous around ~~sett~~ dwellings and paths

Rose purple color smoother species toward back of ridge.

(possibly several forms in this no.) 4% det. Doty

33815 E, F, I: Porolithon gardineri (Foslie) Foslie f. gardineri

33815 A, B, D, C, G, J. P. g. f. subhemisphaerica Foslie

33815 H Porolithon sp. (with goniolithon spp.)

forming black crust

tree 8 m. tall; fruit ripe, fleshy part orange, very sweet, strong banana flavor. "Lono"

herb up to 1 m. tall, tending to be tangled; aromatic when broken; flowers yellow.

caespitose, up to 1 m. tall; flowers fragrant, maroon without white within, filaments maroon. inner segments all white.

1951 Marshall Is.

central part of island, grassy ground cover under coconuts.

33824 Premna obtusifolia R. Br.
5 a few trees in central depression

6 22 Vigna marina (Burm.) Merr.
large patch near lagoon beach

5 23 Hibiscus tiliaceus L.
single tree near center of island in depression

5 24 algae
on lower side of leaning coconut trunk

5 25 Cleocharis obtusa (Wild.) Schult.
on bare desiccating mud of long-abandoned taro pits.

5 26
drying crust on bare muddy bottom of long-abandoned taro pit.

2 27 algae
on side of well depression

2 28 algae
on vertical side of well

5 29 Euphorbia ~~thymifolia~~ ~~L.~~ prostrata Ait
around edge of well near brow

5 30 Centella asiatica (L.) Urban
local, nearer lagoon beach

2 31 green algae
in well, on gravel and floating (well in use)

small bushy trees 5' m. tall resinous when broken
prostrate; pedunculate. flowers yellow.
spreading trees 8 m. tall, branches reaching ground. flowers yellow with maroon center.

tufts.

yellow-green before drying.

prostrate, purplish.

prostrate.

1951 Marshall Is.

33832 Phyllanthus niruri L.
5 common locally around well
x 33 Asperagus in water of well

Soil sample #19 - peat, etc. from upper 6" in bottom of old, long-abandoned taro pit. trough, dark brown, root-filled.
Two old coconut trees growing in bottom.
Bottom bare of vegetation except for a few tufts of Eleocharis and an algal skin, desiccating.
Side slopes with Fimbristylis, etc.
Soil beneath peat 5-6", gray.

This from north central part of island. A number of such pits more or less identical.
A few show some recent digging, and these show signs of hog-wallowing.

Vegetation open coconut grove with thick grass ground cover, mainly Digitaria, with scattered Taro (some tubers seen

erect.

green, very slimy

harvested here), scattered patches of Polypodium, large areas of solid Euphorbia Chamissonis, occasional Pandanus scattered in grove.
-Clerodendrum
Wedelia belt along inner side of seaward ridge, inside scrub belt, in places much wider, tangled with young trees.
Some areas show results of burning grass - fire apparently originating when piles of coconut rubbish are burned.

Central depression in southern central part has Premna, Hibiscus, Breadfruit trees.
Breadfruit and Calophyllum around region of dwellings in south central part, Lagoon half.

1951 Marshall Is.

Dec. 14

4 p.m. almost clear sky gentle breez wet bulb 25.3°C dry 28°C.

6 p.m. almost clear sky, almost calm. wet bulb 24.8, dry 26.8C.

central part of islet - several water-holes - some mosquito larvae - Vial # 33, and many Cyclops from a well with rotting coconuts and leaves in it - Vial # 34.

~~#5~~

North end of islet - # old taro pit just in from passage beach - rather recently cleaned, then apparently abandoned again - cocnut seedlings 1 m. tall in it - Eleocharis and Cyperus abundant. Soil sample #20 is muck from here. The soft material is at least

1.5' deep. sample from top 10". pH 8 (3 tests, Thurs.)

This depression is much more extensive than the recently cleaned part. The rest is a thicket of Premna and Clerodendrum.

North tip drawn out into a finger like projection, quite narrow. Proximal half very open coconut grove, grass ground-cover, much Euphorbia. Distal half with broken undergrowth of Scaevola becoming denser toward tip; beach fringe complete on seaward facing side, hooking around perhaps 1/3 the way on the lagoon side, sparser here.

Beach rock dipping outward lines beach on both sides. Near distal end of lagoon side is an outwardly curved ~~arc~~ arc, following for a short distance the inward-projecting sand spit extending from end of point. thus.

1951 Marshall Is.

Mabel Tidd

Dec. 15 - islet n. of Lado surrounded by beach scrub with some Suriana, etc. & sparse coconut grove inland, with sparse ground cover of Fimbristylis, much bare ground showing, with algal crust.

33834

crust in bare soil

35 Fimbristylis cymosa R.Br. dominant in sparse ground-cover.

Seaward part of island prolonged into a long curved neck. The island is only vegetated in the large lagoon-ward portion. The part of this most seaward is only scrub, sparse in the center. The narrow neck is absolutely bare, but here and there with some sand. The bedding of the rock is apparently horizontal.

36

very common between tide & solution surface

long cracks on reef surface, inequularly intersecting,

soil sample #21 brown loose soil, at least 10" deep.

Coconuts with almost no inflorescences, some of them very slender and abnormal, mostly healthy-looking but just not producing nuts.

tufts, leaves stiffish.

Passage between islet and Lado has reef-rock eroded away seaward from lagoon in an irregularly scalloped manner, with an undercut shelf on inner side, mushroom rocks.

Surface mostly very deeply pitted, tall rims around solution pits. Part near Lado has some loose detritus and has sharp edges abraded off.

brown; firmly gelatinous.

solution-eroded & V cross section. Origin not evident.

Dec. 15 - Lado Islet

37937 Halimeda
bottom of lagoon end of south passage

2 38 Halimeda
bottom of lagoon end of south passage

3 39 Tacca leontopetaloides (L.) Kuntze
open coconut plantation.

4 40 Artocarpus altilis (Park.) Fosb.
scattered, near dwellings, seedlings numerous under parent tree.

5 41 Thuarea involuta (Forst.) R. Br. ex Sam. v
occasional in grass ground cover.

5 42 Euphorbia heterophylla L. ✓
common very locally, near cemetery.

5 43 Catharanthus roseus (L.) Don ✓
local, in cemetery

1 44 ~~Cat~~ Sida fallax Walp. ✓
one plant seen, in coconut grove

5 45 Cyperus odoratus L. ✓
small colony in mucky organic soil in old taro pit.

5 46 Clerodendrum inerme (L.) Gaertn. ✓
thicket in old taro pit, also along inner edge of beach strand.

5 47 Pemphis acidula Forst. ✓
one tree on extreme west point of island, on sand-covered beach-rock.

gray-green, rooted in sand.
— flowers green & filiform bracts purple.
— tree 8 m. tall, sap milky.

prostrate, mat-forming; flowering branches erect; bracts partly red.

flowers white.

erect.

tangled sprawling shrub, forming masses up to 3 m. tall; flowers white with maroon stamens & style.

— gnarled old tree, 2 m. tall; ~~fl~~ leaves astringent; flowers white.

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33848 Portulaca samoensis v. Poll.
common in thin spots in ground cover on gravel soil.

5 49 Premna obtusifolia R.Br.
local around old taro pits and depressions forming thickets

x 50 Bryophyllum pinnatum (Lam.) Kurz
local around depression in center of island.

Dec. 16 Likiep Islet

5 51
on surface of wet soil in old taro pit.

x 52 Pisonia grandis R. Br.
a few scattered trees in beach scrub-forest

x 53 Jussiaea
two plants seen in taro pit

x 54 Paspalum vaginatum Sw.
abundant in and around taro pits

5 55
on dead part of Pisonia tree in beach scrub forest

x 56
on bark of dead part of Pisonia tree in beach scrub forest.

x 57 Canavalia microcarpa (D.C.) Piper
in inner edge of beach scrub-forest.

prostrate, root tuberous; leaves fleshy, flat; flowers yellow.

small bushy tree 5 m. tall, lemon-scented when broken; flowers green; "kaai".

leaves very thick; sterile.

pinkish gray, crumbly-gelatinous.

old scraggly tree, partly dead; sterile.

sterile.

sterile; culms erect & ascending

cream-white in color, darker above.

extensive vine, climbing over trees; flowers magenta.

33858 Russelliα equisetiformis Schlecht. ✓ α cham. plant caespitose, stems arching - procumbent; flowers red. small tufts.
occasionally cultivated around houses

59 Cyperus javanicus Houtt. ✓
rare around buildings, lagoon side of island

Dec. 15 Lads Islet

1 60 Barringtonia asiatica (L.) Kurz ✓ seedling o.s.m. Dd.
at top of beach
possibly from drift seed.

1 61
on rotting coconut petiole

Vial 35 - insects picked up around camp. Termites had collected on bottom of a wooden box but had made no burrows.

Dec. 16 Libiej Islet

Vial 36 - animals found under bark of dead part of Pisonia tree in beach scrub forest - lower layer. Upper layer - cochineal scales found on Scaevola leaves.
~~Others arboreal~~

Vial 37 - Orb weaving spiders.

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Dec. 18 - Islet just inside passage - sand piled up & few coconuts - Ithor trees.

Islet to rt. of passage - sand dune on inner corner next to passage. Little beach scrub except on outer part of passage beach, some along seaward beach.

Islet to left. - Passage beach well lined with Scaevola - seaward beach has Scaevola fringe + row of Messerschmidia just inside it. Coconuts close to beach

Low cliff ("1-2") of rock below seaward beach at mid-tide (?) (1:45 a.m.)

—

MacNeil brought pieces of Russelia equisetiformis, Catharanthus roseus + Euphorbia heterophylla from Enijan I

and reported a mangrove depression, apparently with Bruguiera, on Jeltenet Islet!

Likiep atoll.

Viewed from sea as ship went by.

→ south end is low scrub for about 1/4 the length of islet, scattered coconuts on distal half.

4 of the 6 small islets between this and Likiep - well wooded, with a few coconuts. The second and fifth only have low scrub.

Likiep Islet - seaward beach with scrub fringe the whole length except on a short stretch near w. end. The village on the east which the village is low and sparse, seen from the sea.

Dec. 16 - Likiep Islet
east passage beach
has areas of shingle
with no vegetation.
Messerschmidia forest
backed by Pandanus
forest between shingle
and coconut plantation.
Coconut plantation
on this end of islet
has very rocky soil -
mostly broken coral.
this becomes a shallow
blackish soil further
north, then varies
to broken coral with
~~[illegible]~~ sand that has
not much organic
matter. The ~~[illegible]~~ north
end of the islet has
partly this and
partly blackish soil.
The coconuts are at
a moderate distance
apart. The ground cover
is generally grassy -
Lepturus, Digitaria, and
Fimbristylis, varying
in proportions. one or
other dominant. Locally
but sometimes over large
areas Euphorbia cham-
issonis becomes dominant,
almost pure stands.

Polypodium scolopendria
forms colonies, especially
under trees. Wedelia
forms patches locally,
as does Vigna marina
and Canavalia microcarpa.
Triumfetta procumbens
is occasional, especially
near lagoon. Tacca
is occasional, especially
inland. Cassytha
forms mats here and there.
Pandanus is scattered
in this plantation as

of point south bare beach rock,
very complicated pattern

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Dec. 16 - Likiep, Islet east passage beach has areas of shingle with no vegetation. Messerschmidia forest backed by Pandanus forest, between shingle and coconut plantation.

Coconut plantation on this end of islet has very rocky soil - mostly broken coral, this becomes a shallow blackish soil further

Father John T. McCarthy, S.J.
CAU, NAVY 824, Kwajalein
F.P.O San Francisco

Polypodium scolopendria forms colonies, especially under trees. Wedelia forms patches locally, as does Vigna marina and Canavalia microcarpa. Trumfetta procumbens is occasional, especially near lagoon. Tacca is occasional, especially inland. Cassytha forms mats here and there.

Pandanus is scattered in this plantation, as are Morinda, Calophyllum, and Guettarda. Artocarpus is very common near and in the village and around dwellings, but not directly on the lagoon beach and not near the seaward beach.

There are a few old taro pits, some of which have been cleaned out and replanted in recent years, but which are mainly choked by Farpalum vaginatum, Cyperus odoratus, etc. Soil very peaty & mucky.

A few plants of Cyrtosperma are in some of the patches, esp. those

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belonging to Anton De Brum, who says that several years ago there was a revival of interest in taro culture, but that it has died down now and all pits have been abandoned but his.

Further west, where the soil is poorer, the ground cover becomes very thin. Portulaca samoensis becomes common, as does Thuarea locally, and Eragrostis amabilis. Here is one colony of Rhoeo discolor established.

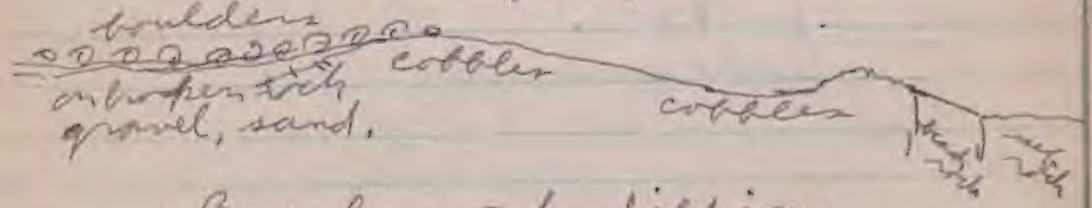
Near east passage, back of village, is a large open grassy space. Here there is better soil, not deep (1 dm.±) but blackish. Used at one time as a baseball diamond.

Along seaward beach directly back of village for at least ⅓ the length of this coast (east) there is a sparse mixed scrubby forest ~~belt~~ ~~at least~~ up to 30-40 m. wide. This has grassy

a rocky opening, is of Messerschmidia, Scaevola, Guettarda, festooned by Cassytha. Wedelia forms, in places, a tangled undergrowth. a few scattered scrubby Pisonia trees.

Here the seaward ridge is back 30-40 m. from edge of ocean, sloping to it, but eastward developing a second lower ridge immediately back of beach; both ridges mainly of cobbles. get a bit closer together eastward. Coconuts to top of inner ridge. Boulders abundantly scattered in plantation for at least 75 m. in from inner ridge.

general profile:



Beach rock dipping seaward all along this bed. Old and eroded.

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about 200-300 m. from end of east point, coconuts, coarse and vegetation is mixed forest of Guettarda, Messerschmidia, a few Pandanus, a few Pisonia, Scaevola undergrowth, tangled with Wedelia, all on very cobbly soil. This gets lower seaward, and ~~disappears~~ becomes Scaevola scrub. Then disappears about 50-75 m. from point, except as Scaevola somewhat follows the cobble ridge around periphery of the area. This bare part of point is illustrated, with its complicated series of beach rock, in the accompanying drawing. (p. 137-3.)

Weeds seen:

Likiep - general.

Birds seen:
common noddy.
fairy terns (occasional)
golden plover (occasional
(Dec. 15) flock of 4 on reef flat at Lae tip)
(Dec. 16) 7 turnstones (several small flocks seen, one of 2-1 birds on Likiep?.)
(Dec. 19) One white reef heron (Kads)
(Dec. 14) One New Zealand cuckoo (Likiep seaward beach)

Rats (R. exulans?) on both Lads and Likiep?.
Lizards - skink,
gecko (not caught)
big green
large gecko (not seen but reported by Father McCarthy)
large black skink (not seen, reported by Father McCarthy)

Pigs, chickens, dogs, cats, humans seen on Likiep.

Jan 4: Lizards from Lads dell.
Hermit crabs from Lads.

p.46 [illegible] Dec. 18 – at house
2:35 p.m. sky mostly overcast gentle breeze wet bulb 27°C. dry 28°C.
8:45 p.m. bright starry sky. calm. wet bulb 25.5°C. dry 26.5°C.

Flock of 15 Fregatta minor seen (breast white) over islet. 1 Sula sula, 1 Sula leucogaster seen near islet.
Common noddy occasional.
Fairy tern occasional.
Birds obviously common, judging from staining of Pisonia leaves and ground by guano.

Vial 38 – scorpion found in house floor, insects caught around light.

Jar #5 – snails found on rocks above high tide level – crab found in same place. Hermit crabs found at top of beach. At least two species of land-crabs, the flat ones not found

Sand piled quite high on east side. Here there is much fine gray to black pumice, in pebbles from minute to several inches thick (sample #22), several of which (sample #23) are covered partly by a mat of roots – not possible to say what kind.
Two large cobbles of a coarse black scoriaceous pumice, very water-worn also found (sample #24).

In box of Jemo insects – moths that came to light. Also snail shells found at edge of Scaevola fringe at top of beach.

---

far from beach, the thick purple ones found anywhere on island.
Lizards, skinks, very common, especially around house, mostly on ground.

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Undisturbed beach showed 44 turtle tracks fresh enough to still show footprints, indicating that at least 22 turtles had come up to the top of the beach to lay eggs. ~~Holes~~ Depressions in the ground indicated where eggs had been deposited! (Photos of tracks)

Went out at 2 a.m. found only two new tracks, found the turtle that made them heading back toward the sea. turned him over to be photographed in the morning. He was very large and heavy, measured over 30" across and 4' from nose to tip of tail (head withdrawn in).

No new tracks in the morning.

Dec. 19 -

Vial # 40 - larvae with cases were on decaying coconut leaves forming side-wall of porch of house, common. Ants on Phyllanthus niruri plants (same sp. as in Vial 39). Orb-weaving spiders between young coconut seedlings, & Pisonia seedlings, etc.

Dec. 19 - mostly cloudy
frequent showers
sun for short periods
almost calm.
wet bulb 27.5°C. dry 28.3°C.

broken clouds, moderate
breeze
wet bulb 20°C dry 27°C.

Pisonia grove - extends
in a narrow belt along
the west side of the
island on the high
ridge back of the beach.
Trees 60-70' tall, ~~to~~ up
to ~~tot" ca~~ 13' circumference
breast high (large branch
below this on one measured);
8-20' apart, canopy
almost complete, no
undergrowth except
~~few~~ Pisonia root sprouts.
Ground well stained
with guano.
Soil profile #25. (partial profile)
3 layers - 2', not dug deeper.
Layer ~~#~~ 1 - dark reddish
brown (5YR-3/2 - 2/2) peat 0-0.5'
structure - tough but very

friable when crushed.
texture - very fine peat
but with many roots.
pH 6.5 sample 25-1.
Layer 2 - 0.5-0.8' matrix very
dark gray-brown (10YR-3/2)
grains white (10YR-8/2)
Structure - weakly cemented,
some parts can be crushed
by strong pressure from
fingers.
Texture - cemented
coarse sand, forming
a soft rock. pH 7
Layer 3 - 0.8-2'+ (hole not
dug deeper). very dark
brown (10YR-2/2) with
tiny white grains.
Structure - loose.
Texture - sandy loam
with gravel, becoming
more rubbly downward.
pH 8.
Another partial profile #26
Layer 1 - 0-1' - dark reddish
brown peat (5YR-2/2-3/2)
structure - friable
texture - fine powder
with many roots.
pH 4.5 (3 tests, Truog)
Sample 26-1
Underlain by a coarse ~~cement~~
rubble of fragments of a
cemented material

(margin: sample 25-2)
(margin: sample 25-3)

with a very dark brown (10YR-2/2) matrix and white grains.
Sample 26-2
Located not far from #25

The ~~material~~ material in the second layer these samples may well be cemented by phosphate. It seems characteristic in and immediately around the Pisonia grove.

At the north end the Pisonia grove has a grass ground cover.

Vial 39 - around roots and in depression ~~at~~ in base of Pisonia - ants had nest in this depression about 0.3 m. above ground. Sting and bite viciously. Isopods in same depression and in litter on forest floor. Pupillids mostly on ~~rocks~~ pieces of rock that seem to be the phosphate cemented material of samples 25-2 + 26-2. Terrestrellinids on dead Pisonia leaves and twigs in depression on trunk. Orbiscs on ground.

Coconut grove - rather closely planted but with some sparser spots.
Ground cover of Lepturus, Triumfetta, etc

Soil profile 27 (partial profile)
0-3'4 four layers
Layer 1 - black (10YR-2/1)
0 to 0.7' pH 8 (Truog)
Structure - crumbly.
Texture - fine "silty" ~~so~~ with some gravel, grass roots, some coconut roots. Sample 27-1
Layer 2 - black (10YR-2/1) with conspicuous white grains. 0.7-1.1'
Structure - loose rubbly.
Texture - mixture of "silt" and fragments, coconut roots.
Sample 27-2.
Layer 3 - salt + pepper mixture of dark gray (10YR-4/1) and light brown gray (10YR-6/2) 1.1-2.4'
Structure - loose.
Texture - loamy sand.
Layer 4 - very pale brown (10YR-8/3)
2.4'-? hole not dug deeper
Structure loose
Texture - very coarse sand.

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Cocoanut grove on ~~west~~ west side, adjoining Pisonia grove, also where house is situated, has a great many Carica papaya in second story, along with a few Pandanus. Tacca is common; Canavallia local, weeds such as Eragrostis, Cenchrus, Euphorbia prostrata, etc. local. Most of second story (an intermediate story bet. second and ground cover, is of great numbers of cocoanut seedlings about 2 m. tall (to tips of leaves). A few trees of several years age, most rather tall. Many nuts on tall ones.

About the house is a veritable weed-patch - Cenchrus abundant, Digitaria also, Euphorbia hirta, Canna, Physalis, Phyllanthus niruri, and various obviously planted species, ind. Artocarpus, Plumeria, Clerodendrum inerme, Pseuderanthemum, agave,

many common noddies seen flying overhead. Some fairy terns, one a two boobies, and in evening, several frigate bird.

Vial 41 - ants on Morinda leaves.. Larva on Pisonia tree. Spider on beach. + Blattid on ground in opening, under Pandanus.

Vial 42 - insects on small staminate Carica papaya inflorescences.

→ Curculionidae on Scaevola leaves - these with tissue very seriously eaten away in spots. Coccinellids also on Scaevola leaves. Blue Chrysomelid in fungi under bark of standing dead coconut tree. ~~Moth in abundance~~.

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Dec. 19 - in coconut grove around house.

3 3862 Agave sisalana Perr. ✓
a few plants around house

3 63 Triumfetta procumbens Forst. ✓
very common in ground cover.

5 64 Lepturus repens (Forst.) R. Br. ✓
very common in ground cover, pure stands locally.

2 65 Plumeria rubra L. ✓
planted around house

2 66 Pseuderanthemum carruthersii var. atropurpureum (+ Bull) Fosb.
planted around house

2 67 Clerodendrum inerme (L.) Gaertn.
planted (?) near house

5 68 Cenchrus echinatus L. ✓
abundant, especially near house

5 69 Phyllanthus niruri L. ✓
abundant, especially near house

6 70 Digitaria microbachne (Presl) Henr. ✓
abundant in ground cover.

2 71 Calophyllum inophyllum L.
planted around house
(also seen as germinating beach drift).

5 72 Physalis angulata L. ✓
common weed, especially near house.

sterile rosette; leaves green, very fleshy.
main stem prostrate, branches ascending; flowers yellow, opening at about 4 p.m.
tangled mats from prostrate rhizomes and erect branches.

small tree; flowers cream white with yellow inside, fragrant.
small tree 4 m. tall; leaves purple beneath, dark green above; sterile.
small thicket; sterile.

ascending to erect.

erect, up to 1 m. tall.

gnarled cut-back small tree; sterile.

extensive sprawling herb; flowers pale yellow, slightly reddish in throat.

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3, 3 73 Euphorbia hirta L. ✓
common around house

3 74 Euphorbia prostrata Ait. ✓
very local in sparse places
in ground cover.

6 75 Eragrostis amabilis (L.) W. & A. ✓
occasional patches
in ground cover, especially
in interior.

5 76 Eleusine
occasional clumps in
openings

Dec. 20 - same

2 77 Tacca leontopetaloides (L.) O.K. ✓ KSR
common in ~~plantations~~
coconut grove.

5 78 Morinda citrifolia L. ✓
common in grove

5 79 Boerhavia
common generally

5 80 Fleurya ~~underalis~~ aestuans. ✓
common locally in rocky
areas in center of islands.

5 81 Boerhavia
very local in openings.

2 82 Carica papaya L. ✓
very common on west
side of island in coconut
grove.

~~82~~

sprawling at base,
erect at tip.
— prostrate, purplish.

spreading tufts.

clumps, almost erect.

acaulescent, leaves
and scapes erect.

shrub 3-4 m. tall; leaves
glossy; flowers white,
— fragrant; fruit white.
— forming large mats;
— flowers pink.
erect, stems green,
fleshy.

prostrate, green;
— flowers pink.
erect single-stemmed
herb with great rosette
of leaves, flowers
cream-white.

1951 Marshall Is.

· Pisonia grove along west side - in open parts toward south end Leptinus is place forms a ground cover. Small colony of Cordia near beach. In south part Messerschmid is becomes common, some of trees almost as tall as the Pisonia.

One Pisonia has several booby nests in it and quite an accumulation of guano under it.

Soil profile 28 Taken here.

Layer 1 - 0-0.4' very dark brown (10YR-2/2) pH 5.0 (2 trug 5 drops) str. tough, friable when worked.
tex. fibrous, root-filled.
Sample 28-1

Layer 2 - 0.4-0.7' color variable light and brown granular, averaging yellowish-brown (10YR-6/4) pH 8
structure - weakly consolidated crumbling under strong pressure from fingers
texture coarse sand, cemented.
Sample 28-2

Layer 3 - 0.7-? very dark gray-brown (10YR-3/2) pH 8
with light grains.
structure - granular

texture - loamy sand.
sample 28-3

1951 Marshall Is.

33893 Cordia subcordata Lam.
5 small colony ~~is~~ at seaward edge of grove, others seen elsewhere.

c 84 on bank of Pisonia.

5 85 on bank of Pisonia.

5 86 Messerschmidia argentea (L.) Johnston. at top of beach at edge of Pisonia forest, fairly common in forest, especially toward south end.

Scaevola scevola on south end of island ✓

5 87 Scaevola frutescens (Mill.) Krause dominant in -

Low forest 3-5 m. tall, principally Scaevola, but with occasional much larger Messerschmidia trees. No ground cover. Surface scattered with pebbles + dead coral. Soil profile 29 -

~~Layer 1~~ Layer #1 0-0.5' pale brown (10YR-6/3) structure - very loose texture - sand ~~Layer 2~~ sample 29-1

Layer #2 - very pale brown (10YR-8/3) structure - hard

This area about 1 m. a more

Jerus Island

tree 6 m. tall; dry fruits only.

tree 5 m. tall (others up to 15 m.); ~~fls~~ leaves fleshy; flowers white.

small tree; leaves bright green; flowers and fruit white.

Layer #1 0-0.5' salt + pepper, averaging pale brown (10YR-6/3) becoming lighter downward structure - very loose texture - sand, some rocks. sample 29-1. gradually changing to

Layer #2 0.5 - 2'+ (rocks become so abundant at 2' as to obstruct digging.) structure - very loose texture - sand with pebbles + cobbles.

below level of ~~plantation~~ coconut grove

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coconut grove, just inside Pisonia grove.

33893 Canavallia microcarpa (D.C.) Piper ✓
5 common locally

open ground toward east part of island; openings covered by Trumfetta and Boerhavia mats, broken by large Scaevola bushes, some patches of Lepturus.

6 89 Cassytha filiformis L. ✓
rare, forming mats, parasitic on Lepturus

3 90 Ipomoea tuba (Schlecht.) Don ✓
common in openings and on bushes surrounding

This area is of sand, apparently blown over the top of the east coast dune ridge. Soil profile #30 —
Layer 1 - 0 - 0.6' fine salt + pepper darker grains very dark gray brown (10YR - 3/2), lighter mes pale brown

small areas where phosphate cemented rock forms surface must have been sites of trees with many bird nests before clearing, which have lost the peat layer. (Samples #31, 32)
vine climbing over shrubs and spreading over ground; flowers pink with very ~~~ pleasant fragrance.

This area formerly covered by coconuts, as rotting trunks and some standing dead are common. Small clumps of young trees.
stem green;
fruit pale green, not quite ripe.
vine trailing on ground; flowers white.

(10YR - 6/3)
structure very loose.
texture loamy sand
sample 30-1 changes gradually to
Layer 2 0.6 - 1.4' very pale brown (10YR - 7/3 - 8/3). structure very loose.
texture - sand, changes ~~~
sample 30 N

1951 Marshall Co.

rather abruptly to
Layer 3 1.4-3' (evidently
a buried A horizon) very
dark gray brown (10YR-3/2)
with mixture of variously
lighter grains, general
effect (10YR-4/2).
structure compact but
very crumbly-granular.
texture loamy coarse sand
texture becoming somewhat
coarser, structure looser
and color lighter, below the
top 0.5'. Sample 30-3
Layer 4 - ~~[illegible]~~ 3'-?
pink (7.5YR-8/4)
structure very loose.
Texture coarse sand
with some gravel.
(hole dug no deeper).

Messerschmidia - heavily
forest on east side -
thick forest little or no
ground cover - filled
with dead & living
leafless branches & sticks
in opener places some
low growth. Terminalia common.
33891 Terminalia samoensis Rech. ✓
x common, especially in
open places.

Jens D.

Dec. 20 - ~~to~~ 10:45 p.m.
broken clouds, moderate
breeze, light shower
in progress
wet bulb 25.5°C. dry 25.5°C.

Dec. 21 2:45 p.m.
sky mostly cloudy,
occasional periods of
sunshine. fresh breeze.
wet bulb 27.3°C. dry 28°C.

Vial 43 - animals found
in this leaf-mold in mixed
forest on sandy soil.

Vial 44 animals found
associated with
Messerschmidia. Caterpillars
eating leaves & flowers,
cocoon or barks (obviously
same as caterpillars); small
ants in complex galleries
in dead stub of large tree.
Remainder on top surface of
fallen living tree, in decaying
depression filled with dead leaves
and ants.
shrub 1 m. tall (others to
3 m.); all seen sterile.

Dec. 21 - Mixed forest on north side of island, on dune sand.

33892 [illegible]
on dead Messerschmidia stub.

3 93 Trentepohlia
on Messerschmidia bark, esp. where exposed to spray-laden winds. orange-color

6 94 Achyranthes velutina H. & A.
in undergrowth inside beach ridge
spreading herb, up to 0.8 m. tall, several m. across; flowers rose-purple.

5 95 Pisonia grandis R.Br.
common component inside beach ridge
tree 12 m. tall, bark cream-white, leaves light green; flowers green.

1 96
on dead Messerschmidia twig.

scrub on s. point of island

9 97 Guettarda speciosa L.
very few plants
shrub 2.5 m. tall, flowers white, fragrant; ripe fruit white, sweet but with bitter after-taste.

5 98 Pisonia grandis R.Br.
dominant in forest on ridge back of beach
tree 12 m. tall, fruiting cymes dry, mostly detached!

2 99 Cocos nucifera L.
planted over most of island
young tree, trunk 2½ m. tall, leaf 17' long, specimen taken from center, concave side of leaflets down.

p. 54 start cut

Dec. 22 — 12:15 p.m.
Broken clouds, fresh breez
Wet bulb 28°C., dry 30°C.
6:10 p.m. clear except for uneven
~~22~~ high cirro-stratus moderate breez
wet bulb 25°C. dry 26.2°C.

33900 Pandanus tectorius Park.
near house (probably planted)

01 Artocarpus altilis (Park.) Fosb.
one plant planted near
house

02 ~~fungus~~
on base of dead coconut
tree

03 auricularia
common under and protruding
from bark of old standing
dead coconut trunks.

Vial 50 - snails, isopods, spider
on under side of phosphate(?) rock
in coconut plantation (note single
different snail - bright orange color)

Vial 45 - orb-weaver in
forest and scrub generally;
moth in orb weaver's web;
Lepisma and cricket on
~~M~~esserschmidia under
dead barks. Grasshopper
caught around lights.

Vial 49 - Thysanoptera (?) inside
bracts of ♀ Pandanus tectorius
inflorescence.

tree 6 m. tall,

sapling 2.5 m. tall.
sterile.

tan-color, friable,
no definite form.

dull pinkish purple a
mauve, when young
and fresh, protruding
parts dirty; crumpled
appearance natural.

Vial 46 - Caterpillar on
Phyllanthus niruri
(also seen on Scaevola).
Small insects on Leptaena.
Sunsweeping.

Vial 47 - on phosphate
rock in Pisonia forest -
snails, etc. Earwig + beetles on
rotted Pandanus fruit in mixed
forest

Vial 48 - caterpillar on
ground in open, under
Boerhavia. small beetle, flies on decaying papaya
2 larger beetles around light.

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sample #33 - phosphatic rock, gum large pieces exposed on surface in coconut grove, in various stages of weathering - some seemingly very hard.

sample #34 surface scraping from under dead leaves under ~~large~~ tall Scaevola scrub in open area on east side of island.

sample #35 - screenings from under Pandanus tree in coconut grove.

sample #36 - screenings from under Pisonia tree in mixed Pisonia - Messerschmidia forest on east side of island.

33904 algae
3 on base of large Pisonia tree in Pisonia grove, on corky cracked bark

5 05 Pandanus tectorius Park. in mixed forest along north coast.

5 06 Pandanus tectorius var. inner edge of mixed forest, east coast

sample # 37 - drift seeds & fruits from beaches. - Barringtonia asiatica, Mucuna sp.

All soil and rock samples from Jemo were soaked with sea-water on return to ship.

Vial #52 - orb weaving spider, both in same web, ~~in~~ between two coconut seedlings. Flies around fallen Pandanus fruit, near house. Not numerous enough to be annoying.

greenish black

tree 6 m. tall, fruit still hanging on tree, but dry; flower surrounded by green-tipped white bracts.

tree 8 m. tall, fruit ripe, yellow at base, edible, sweet, fragrant.

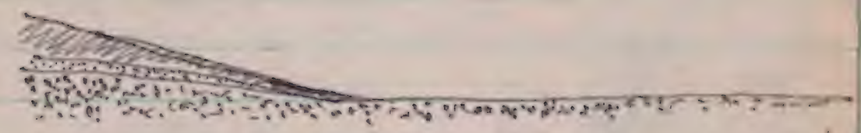
1951 Marshall Is.

33907

on ground where water drips from rain barrel

Jemo is egg-shaped, about 3/4 mile long (from Pan. Pilot).
The reef flat is narrow, perhaps 50 m. wide, on the west side, wider on the northwest and north, on the ~~south~~ east extending 3 miles a more as a long reef of irregular width, on the south-east about same width as on north west, or south projecting almost the length of ~~the~~ the island as shoal water (observed from color of water, also from ~~aer~~ aerial photo.)
~~Circular~~ The long reef extending east shows most peculiar cross-channels on the photographs, ~~p~~possibly a reticulate arrangement of surge channels.
During the time of our visit there was a heavy surf all along the north side of this reef, more at all on the east side.

The island, proper, is almost completely surrounded by a beach-rock a calcareous sandstone, in all places dipping seaward, and where the contact could be seen, resting on, and pinching out on, the reef-rock. One exposure shows a wedge-shaped bed of conglomerate with small water-washed pebbles between the sandstone and the conglomeratic breccia-like reef-rock. This section was thus:



Only on the south end of the south-east coast does this rock protrude at all above high-tide. Here the crests is possibly a foot or two above high-tide, with a trough behind

it, toward the ~~island~~ island.

The weathering of this rock is apparently a combination of solution and abrasion by the load of pebbles and coral fragments that is washed back and forth by the waves. The resulting pattern is a combination of pits that have become small potholes (Plate) and channels that have rather rounded bottoms, the sharp edges of normal pitting are in most places worn down by abrasion. Possibly the texture of the rock, a hard ~~fine~~ coarse ~~sa~~ coral sandstone, may contribute to this effect.

The diagram shows the arrangement of the beach-rock, indicating strike and dip as nearly as it was possible to determine them with no ~~base~~ points located on a base map.

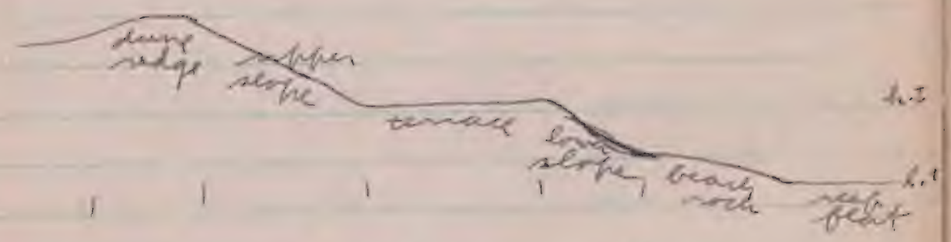
1951 Rose Hall Jr.

it, toward the ~~island~~ island.

The weathering of this rock is apparently a combination of solution and abrasion by the load of pebbles and coral fragments that is washed back and forth by the waves. The resulting pattern is a combination of pits that have become small potholes (Plate) and channels that have rather rounded bottoms; the sharp edges of normal pitting and in most places worn down by abrasion. Possibly the texture of the rock, a hard ~~coarse~~ coarse coral sandstone, may contribute to this effect.

The diagram shows the arrangement of the beach-rock, indicating strike and dip as nearly as it was possible to determine them - with ~~one~~ ~~base~~ points located on a base map.

The beach around most of the island, above the beach-rock, is of fine white sand, with a rather steep slope between beach-rock and high-tide mark: at high tide it usually forms a terrace of varying width, widest on the west side. Above this it slopes up to the dune ridge. Roughly this profile: (with variations in width)



Around the south-east point the slope above the beach-rock is a ~~b~~ cobble-beach extending up to the general level of this end of the island, about 2 m. above high tide. No noticeable ridge here, only a slight one toward the west end of cobble beach.

These cobbles are very much water-worn. ~~Among them~~ On the east beach, slightly north of the middle, is a

light deposit of pebbles and cobbles extending for a short distance on the upper slope of the sand beach. Here were found two cobbles of a black scoria or heavy pumice, very coarse grained but doubtless light enough to ~~float~~ float. Much fine-grained light gray to almost black pumice in the sand here, tiny bits to pebbles the size of a fist.

Around the entire remainder of the island is a low ridge, varying from 4 to 5 m. in elevation above high-tide mark.

On the east and north coasts this ridge is of dune-sand, falling away as much as 7-8' to the flat within. On the west side it is probably fundamentally dune sand, but has been greatly modified (see next p.) On this side it is being very slowly cut away by wind and waves (see insert p. 172) on the windward side it seems

to be building up.

On the ~~south~~ west side this ridge is covered by ~~living~~ forest ~~to~~ 40-75' tall, of trees of varying size, up to 4' diameter breast high. The canopy in most places is complete, resulting in no ground cover, except where light comes in from the side. Where light can get in at all there is a luxuriant broad mat of Lepturus repens. There are a few Cordia trees at the edges of this forest, and toward the ends Messerschmidia become common, in places as much as 60' tall and 2.5' in diameter. These Pisonia trees are the resting sites of numerous Sula sula (~~boo~~ red-footed booby), also roosting places, at least, for Fregatta minor, noddies, and fairy terns. The surface of the ground is in many places much stained by white guano. It is composed of a layer, several inches thick, of ~~clay~~ weathered phosphatic rock with a strongly acid reaction (pH 6.5 - 4.5).

This is underlain by a cemented layer of coarse sand and fine rubble, the matrix being dark brown, probably phosphate leached from the guano. This is underlain by dark gray to black sandy loam. The phosphatic and loam layers are pH 8. This belt of forest is 30-40 m. wide.

Inward from this, to the center of the island, is coconut plantation, very healthy and luxuriant, with a ~~discontinuous~~ black waste fill discontinuous layer of this same phosphatic rock just below the surface, in places concentrated on the surface in low mound-like accumulations. This area probably marks the former extent of the Pisonia forest.

This coconut grove has a ground cover of Lepturus, thin in rocky places (see above), in these Tetuna is common, also Boerhavia, which occur here and there. Locally Triumfetta procumbens dominates, also fair sized areas of

1951 Marshall Is.

Digitaria microbachne, smaller patches of Cenchrus echinatus (especially near house) and Physalis angulata. There is a ~~second~~ story of seedling coconuts about 1-2 m. tall, in places very dense: apparently no copra has been made here recently. A discontinuous third story 3-5 m. tall is made up of ~~Ca~~ Carica papaya, with some Morinda citrifolia and occasional Pandanus. Large patches of this undergrowth are tangled with Canavalia microcapa, forming a loose mat on the ground and covering shrubs and low trees.

Around the house, which is in a tiny clearing in this grove, is a collection of weeds, mostly (but not all) attenuating in all ~~directions~~ directions from the house. Euphorbia hirta, Cenchrus echinatus, Boerhavia diffusa (gigantic forms), Amaranthus viridis, and Physalis angulata are very common. Fragrostis amabilis is here but becomes commoner ~~toward~~ away from the house, in the

Jarvis I.

[illegible] and a gigantic [illegible] more tall) [illegible] occasionally [illegible] ise in [illegible] ca is [illegible] ional. [illegible] and the [illegible] rubra, [illegible] um agave [illegible] arpus [illegible] ng), and [illegible] nerme

[illegible] rd the [illegible] me [illegible] ers

East

[illegible] try of [illegible] trees [illegible] der [illegible] nding. [illegible] rubs [illegible] lly [illegible] of [illegible] and-

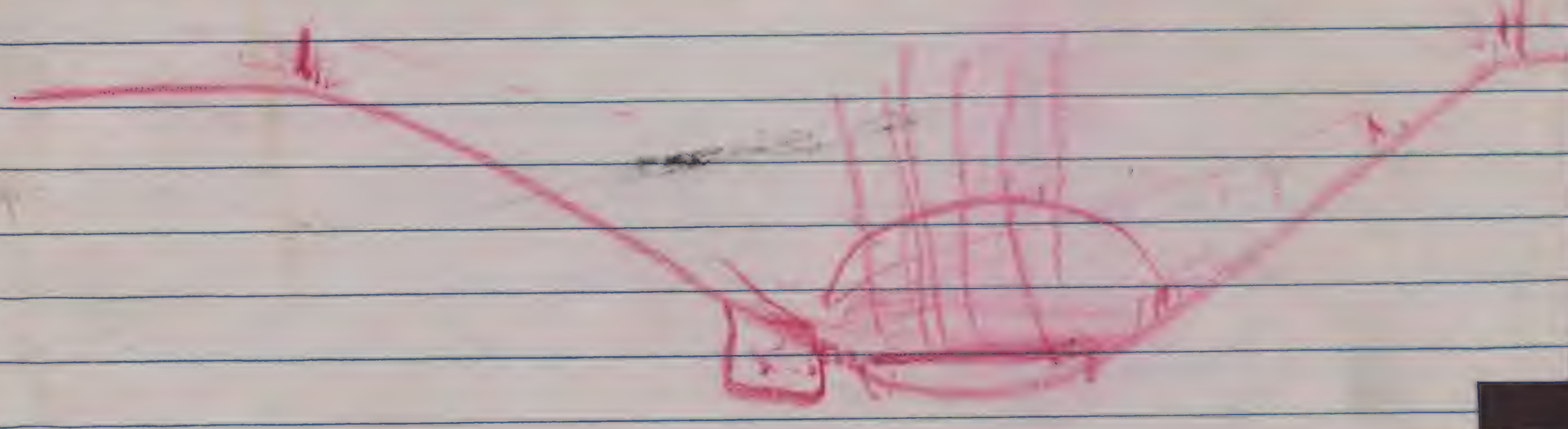
[illegible] a fallen one. The ground is mostly covered by a thick mat, three feet, of

Jeltonet

Eagrostis amabilis

2/3 way up e side

many are in depression.



Digitaria microbachne. smaller patches of Cenchrus echinatus (especially near house) and Physalis angulatus. There is a ~~lower~~ second story of seedling coconuts about 1-2 m. tall, in places very dense. Apparently no copra has been made here recently. A discontinuous third story 3-5 m. tall is made up of ~~[illegible]~~ Carica papaya, with some Morinda citrifolia and occasional Pandanus. Large patches of this undergrowth are tangled with Canavalia microcarpa, forming a loose mat on the ground and covering shrubs and low trees.

Around the house, which is in a tiny clearing in this grove, is a collection of weeds, mostly (but not all) attenuating in all ~~dir~~ directions from the house. Euphorbia hirta, Cenchrus echinatus, Phyllanthus niruri (gigantic woody form), and Physalis angulatus are very common. Eragrostis amabilis is here but becomes commoner ~~toward~~ away from the house, in the

coconut grove, while Euphorbia prostrata and Eleusine indica (a gigantic form, reaching 4' or more tall) are only found occasionally away from the house in the interior. Tacca is common to occasional generally. Around the house Plumeria rubra, Pseuderanthemum atropurpureum, Agave sisalana, Artocarpus altilis (one sapling), and Clerodendrum inerme are planted.

To the eastward the coconut grove seems to be in much less healthy condition. East of the middle of the island the majority of mature coconut trees are dead, the trunks mostly still standing. Young trees with trunks 3-6 or 10' tall are locally common, often a ring of them ~~[illegible]~~ surrounding a standing dead trunk or marking a fallen one. The ground is mostly covered by a thick mat, knee deep, of

1957 Marshall Is.

Triumfetta procumbens
or, locally, Boerhavia. This
area is much more extensive
than the almost bare area
showing on the 1944-45 photos.
Scaevola frutescens is
coming in very vigorously,
and locally, especially
in the region bare in 1944,
there are large, spreading,
low-dome-shaped clumps
of Messerschmidia. Mats
of Boerhavia are occasional
but one of Cassytha was
seen (mostly parasitic on
Leptunus. A very definite
succession seems to be
taking place here. When
the old coconuts die, Leptunus
is left as a ground cover.
It is rapidly crowded out
by Triumfetta which becomes
dominant and much more
luxuriant than I have seen
it elsewhere. Locally mats of
Boerhavia manage to hold their
own. Scaevola frutescens
is rapidly invading and
spreading, forming a scrub
of confluent mound-shaped
plants, up to 3 m. across and
high. The branching is
of a horizontal-terminalized
type with long straight

Jemo I.

ascending branches—
[illegible], the branches
making a dense tangle
and the rosettes of leaves
forming a complete
canopy surface. The
Triumfetta rapidly thins
out, dies and disappears
completely, leaving
no ground cover at all.
Obviously the young
coconuts will soon
assume general dominance over most of this
area. Some of it, especially
where bare spots
existed in '44-45, has no
coconuts, as yet.
The soil in this half
of the island is pure
fine sand with some
humus. It probably
blows inward continually
from the windward
beach. There are some
rather prominent mounds
in the open parts toward
the east.
The dune ridge to the
north of the Pisonia grove,
and on around the east
side of the island, is covered
by a mixed forest of Messer-

schmidia and Pisonia, the former alone on the outer edge, the latter becoming important inward, and down off the dune ridge for some meters inward on the flat. Where this forest is tall it is open beneath, and where really dense it lacks ground cover and undergrowth. Toward the beach side it becomes tangled with low Messerschmidia branches and plants. Terminalia samoensis, ~~and~~ Echyanthes splendens, and Scaevola occur here. On the inner edge of the belt, on the western half, there is a dense belt of young coconut trees, at present 3-4 m. tall, to top of leaves. Eastward this is replaced by dense Scaevola scrub with some Messerschmidia.

Toward the south Scaevola becomes most important in the mixed forest, the belt becomes ~~wider~~ and of lower stature. The area within the curve of the cobble-beach ~~is~~ ~~that~~ is covered entirely by a mixed scrub, principally

Scaevola, but with many Messerschmidia and few Guettarda plants. The Messerschmidia extend above the level of the scrub. The edge of this tapers off to the top of the cobble beach, where there is some bare sand with Portulaca and Trumpetta. The outer edge of the mixed forest on the dune ridge, also have Trumpetta and an irregular turf of Portulaca in open places.

Forest p. 171 This is shown by large trees standing up on stilt like roots, with small ones growing on the beach flat between them, some of the large ones in tipped outward positions, and by protruding and undercut beds of phosphate rock.

In the scrub on the south end, cobbles and boulders are abundant ~~over~~, becoming

less so inward. On the southwest the inner edge of this scrub is marked by a rounded change in level of about 7-8' upward to the coconut grove, the trend being slightly north of east. This seems to disappear inland. Along it, on the coconut grove side, 75 m. or more from the beach, are boulders, including a couple of slabs of beach-rock fully 12 sq. ft. in area and a foot or so thick.

Salt spray was observed to be blowing inward in noticeable amounts from the windward (east) side. Chlorosis was only noted in weeds such as Euphorbia hirta, Phyllanthus niruri, and Carica papaya, and this only around the house in the open clearing, and to a slight extent generally in Physalis, also slightly in Clerodendrum.

Some chickens exist on the island, their scratching being quite evident. They are not many. No rats or evidence of rats were seen. Skinks are common, especially around the house, but no other lizards were seen. Birds noted were

Red footed booby - nesting in numbers
Brown booby - one seen flying, for certain.
Frigate birds (Fregatta minor) - at least 15 seen flying at one.
Fairy tern - quite common.
Common noddy - quite common
White crowned noddy - several seen but identity not absolutely certain.
Golden plover - one seen positively, one doubtfully (at a different time, may have been same one)
What looked like two owl pellets were being chewed on by hermit crabs.

Turtles apparently visit the island at low tide when the moon is practically full. Tracks of at least 23 individuals were found, comparatively fresh, leading directly up across the beach to the edge of the vegetation, usually ending in a hole several feet across, either at the edge of or inside the vegetation, scooped in the sand.

The one turtle found was caught at x a.m., tide very low, moon bright. It was a powerful animal, dragging itself across the rough rocks quite rapidly, heading back toward the sea. When turned over it struggled for a little, then calmed down, emitting a sighing "ahh" sound and tears running from its eyes (my companion's observation). Next morning it was laying quietly but struggled violently when disturbed. After being photographed, it was

released and lost little time in reaching deep water. It was mottled dark olive drab above, yellowish below. Its mouth was a hard triangular beak with sharp jagged edges. It did not attempt at any time to bite. Its front flippers were long and broadly sword shaped, the hind ones short and broadly spatulate, tail short, triangular.

Digging for eggs in a number of fresh holes was completely unsuccessful. Already undisturbed nests were found a little below the bottom of the hole. The eggs were finally found in a small hole, about 2' deep and a foot or less in diameter, under the broad pile of sand thrown out of the large hole. There were 106 of them, closely packed. They were round, white, about the size of

golf balls, with smooth dull surface, a translucent spot on one side where the yolk rested. The shells ~~~~ were only slightly calcified denting on contact with other eggs a with fingers. The whites were completely non-viscous and did not coagulate on cooking. The yolks were yellow and soft. When cooked ~~they~~ scrambled they resembled a cheese omelette or an over-cooked welsh rabbit in both taste and consistency.

The ground and the Leptalsus turf at the edges of the forest were considerably disturbed by the holes dug by the turtles.

Other than birds, crabs are the most evident animals. The burrows of the common purple land crab are found all over the island. The crabs are seldom seen during the day. Burrows of the broad flat gray olive shore crab are common above high tide

mark and ~~in~~ the edge of the forest. The common colored shore crab forages above high tide mark. Two species of hermit crabs are very common inland. The robust one with purple bands across ~~the~~ its legs is commonest. It seems to forage principally on the ground, and a group of them will be found around anything even possibly edible. The larger red species, usually inhabiting Turbo shells, while sharing the habits and diet of its neighbor, also climbs ~~~~ shrubs at least to a height of 2 m. It was often seen in bushes but it was not evident what it was after. A favorite food for both kinds seems to be Pandanus fruits, the pulp of which is eaten soon after the fruit falls.

Insects are quite evident, but not very abundant. The common atoll butterfly (Hypolimnas bolinae?) is common in two color phases. The speckled day-flying moth ~~& [illegible]~~ is very common in openings. Smaller moths are commonly scared up when walking through openings, also attracted to light. Three large flies are common around the house, including the common housefly. At least one species of Drosophila is found around overripe papayas and pandanus fruits. Small beetles (Nitidulidae?) are found also here. They range from tiny light brown to larger brown and much larger black individuals.

A fair-sized weevil is found on Scaevola, eating holes in the leaves, also (or a similar one) on the male flowers of Carica.

A green lepidopterous larva eats Pisonia leaves,

in places giving the trees a ragged appearance. Another, resembling a cut-worm, is found here and there on weed plants. Still another, a hairy black one, eats leaves and flowers of Messerschmidia.

At least 4 species of ants are common — a large black stinging one with great mandibles, living in cavities around bases of Pisonia trees, foraging generally; the "crazy ant" living in burrows in the ground; a tiny brown one in galleries in dead stubs of Messerschmidia; and a small blackish sluggish one found under stones, logs, etc. in burrows.

At least two Hemiptera and ~~one~~ two leaf hoppers are common on Scaevola.

An elaterid was found, but not caught, in a hollow dead twig. Another commonly came to lights.

Two coccinellids were

occasional on leaves
leaves.

A lepidopterous (?) larva which builds cylindrical paper-like cases up to 7-8 mm. long is very common on dead coconut leaves, bark of trees, etc.

A very active earthworm is occasionally found in humus, even on top of logs, also seen in soil ~~on~~ in coconut plantation.

Orb-weaving spiders of perhaps two species are very common, spinning webs between bushes, coconut seedlings, etc. How they all get enough to eat is hard to see. Several other spiders inhabit crannies in the ground & rocks, including a couple of species of hunting spiders.

At least 5, possibly 6, species of true land snails are ~~found~~ found in the humus layer at the soil surface. The pupillid is found in numbers on rocks in Pisonia forest and mixed forest. The tornatellinid on decaying twigs, etc. The

elongate yellowish are in humus and on rocks. The spirally striate one is in humus. The elongate orange one, one individual only, found under a stone.

Two species of operculate littoral snails are found on rocks, logs, etc. above high tide.

At least two mites and one millipes found in humus.

The weather was variable during the visit, from clear and almost cloudless to completely cloudy and rainy, sometimes scattered showers, wind from gentle to stiff breeze, temperature from 25.5° to 30° C.

1951. Marshall Is.

Ecological processes seen or inferred on Jemo Island.

A Basic, pre-colonization processes (but continuing after colonization).

1 Rise in sea-level after glacial period, possibly drowning all land life, permitting ~~reef~~ reef surface to reach a high uniform level during post-glacial xerothermic period.

2. Possible emergence of land by bar-formation.

3 Fall of sea-level after post-glacial xerothermic period.

4 Climate becomes more humid after post-glacial xerothermic period.

5 Emergence of ~~land~~ reef surface resulting from fall in sea level.

(1-5) Completely inferred from knowledge gained elsewhere.

6 Building, destruction, and change of land surfaces by typhoons, storm waves, tsunamis, etc. (Inferred from evidence seen on this

and other atolls).

7 Cementation of "beach-rock" and "reef-rock". (Process, time, situation unknown; process inferred only from existence of these rocks).

8 Addition of $CaCO_3$ from various marine sources as sand blown up from beaches, gravel, pebbles, cobbles, boulders thrown up by storm waves. (Sand blowing seen, rest inferred from presence of material in places of deposition).

9 Accumulation of body of brackish or fresh ground water resulting from excess of rain accumulation over diffusion and mixing processes. (Inferred from existence on other islands and from existence of moist soil here).

10 ~~Diffusion~~ Salt accretion ~~by~~ from spray blown inland.

11 Diffusion inward of salt water from periphery and

from below, aided by tidal mixing action. (inferred).

12 Washing outward and downward of salt by rain water.

13 Solution of small amounts of $CaCO_3$ by rain-water. (inferred)

14 Removal of dissolved $CaCO_3$ by diffusion and tidal action. (inferred)

15 Fluctuation of salinity with wet and dry seasons. (inferred).

16 Desiccation by evaporation, accelerated by sun's heat and by wind.

B Colonization processes. (mostly inferred)

17 Visits by sea-birds and shore birds.

18 Colonization by crabs from free-swimming pelagic larvae.

19 Boerhavia, Vigna, and possibly Tournefortia brought by birds, established as

pioneer plant species.

20 Scaevola, Messerschmidia, Terminalia, Cordia, Ipomoea tuba, Pandanus, and Guettarda seeds arrived in ocean drift, become established as pioneer species.

21 Spores of blue-green algae, possibly seeds of Leptinus, arrived by wind, become established as pioneer species.

22 Introduction, principally by wind, of insects, land snails, and land arthropods of various sorts.

23 Introduction, by wind, of soil bacteria and soil fungi.

24 Limitation of establishment of species by salinity.

25 Limitation of establishment of species by lack of proper habitats.

26 Introduction and establishment of non-pioneer species as more mesophytic habitats develop.

27 Introduction of parasitic and predaceous species, as well as saprophytic and saprophagous species after establishment of proper hosts, prey, & sources of organic matter.

28 Production of more mesophytic habitats by action of plants established.

C Successional processes. (inferred from observation of stages in processes) (All processes in B also properly belong here)

29 Destruction of vegetation by storms, etc. (inferred)

Successions observed:

30 Lepturus and Triumfetta on beach to Messerschmidia forest to mixed Messerschmidia and Pisonia, to Pisonia.

31 Lepturus and Triumfetta on beach to Scaevola scrub to Scaevola-Messerschmidia scrub

to low forest of same, possibly to mixed forest.

D Normal continuing processes. (here belong also #2, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, some of these, as 8, 13, 16, 22, 24, 27 may be accelerated as total process progresses, some, as 6, 19, 20, 24, 25, may be decelerated.)

32 Carbon cycle.

33 Nitrogen cycle.

34 Production of root, leaf, trunk, and twig organic matter by plants.

35 Breaking down of this organic matter into humus by bacteria, fungi, insects, crabs, isopods, snails and other plant eating organisms, both those that eat living and dead plant tissues.

36 Production of animal organic matter by all animals (p 197)

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+ soil profiles

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present.

37 Predation of soil fauna by crabs, spiders, etc.

38 Predation of insects by lizards, spiders, crabs(?) etc.

39 Deposition of excrement by purely land-dwelling animals.

40 addition of phosphatic and nitrogenous matter brought from sea by birds in form of guano, feathers, bodies, etc.

41 Leaching out of these same materials by rain water. (imperf).

42 Cementation of calcareous material by phosphatic cement in forests used as roosteries and roosting places by sea-birds.

43 Catching of sand blown from beaches, by vegetation, resulting in formation of dune ridges around periphery of island. (p. 199)

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44 Slow undercutting of west peripheral ridge, apparently by storm waves.

45 Mixing of humic and other layers of soil by burrowing of crabs and digging of turtles.

46 Enrichment of soil by floating pumice.

E Processes following and dependent upon human activity. (Other processes, of course, continue).

47 Reduction of numbers of turtles by hunting. (Theresay)

48 Reduction of numbers of birds by disturbance ~~and~~ hunting, and egg-hunting. (inferred.)

49 Replacement of greater part of vegetation by coconut plantation.

50 Removal of phosphatic, nitrogenous and carbonaceous material in copra. (inferred but quite certain).

51 ~~Death of~~ Introduction of weeds and cultivated plants, and establishment of some of them.

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52 Death of large number of coconut trees, especially in ~~eastern~~ eastern half of island.

53 Occupation of some available habitats by weeds - i.e. ~~Papaya~~ Carica, ~~and~~ Morinda in understory, grasses and other weeds in openings left by dead coconut trees.

54 Succession after death of numbers of coconuts, leaving open areas - Lepturus, to Cumingetta, to Scaevola, to Cocos.

55 Establishment of dense understory of coconut seedlings in plantation after neglect of copra-making.

56 Clearing of this, probable burning of trash. (inferred)


Sokpang
Kŭmgong-ni
Ferry
Kangam
Hyo-dong
Pulligijang
Sinsŏng-dong
KŌNJI-SAN
Ferry
Umgondae
Yŏnbong-ni
Mokkwa
Muksang-ni
Chiksin-dong
Sinbang
Map'yŏng
Moch'ang
Hoeha-ri
Kip'ŭnnae
Osang-ni
Oga-dong
Yongsan-dong
Kansang-ni
SANGJU
Tajŏng-ni
Sinha-ri
IWI-CH'ŎN
An'gyejang
Kujam-ni
Sŏksang-dong
Songch'on
Saengmul-li
Naktong-ni
Toho-dong
Pŏpkang-ni
Naktong
KAPCHANG-SAN
Pongch'on
Hŭngjŏn-dong
Tongjŏng-dong
Sujung-ni
P'yŏngo-ri
Mak-tong
Sin'gok-tong
Sangguk-tong
NAKTONG-GANG
Magong-ni
Sinch'on-dong
Poch'on-dong
Pot'ong-dong
Suha
Sanch'ŏn-dong
Chua-dong
Songch'ŏn-dong
Hwasil
Chugwŏn-dong
Saenggok-tong
Tongjae-dong
Oga-dong
Musang
Hado-dong
Sungam-dong
Mudŭng-dong
Sŏnsan
Ch'ilbong
Sangmun-dong
Kach'ŏk-tong
Sojae-dong
P'yŏngji-dong
Munmu-dong
Chup'yŏng-dong
Kŭmgok-tong
Sambong-dong
Sŭmmun-dong
Koksong-dong
Kwonsim-dong
Tomyŏng-dong
Sinch'on-dong
Tori-dong
(Toremi)
Kuya-dong
Paesinae
Posin
Oeye-dong
Hanggok-tong
Sin'gi-dong
Pŏkp'yŏng
Kwanghan-dong
Kŭmgok
Hanam-dong
Taeji-dong
Munsŏng-dong
Sangnim-dong
Tae-dong
Namch'on
KYŎNGBU
MAIN LINE
Kŏŭi-dong
Kumi
Kumi-ch'ŏn
Han-ch'ŏn
Sinjang-dong
Sinch'on LINE
Chongsang
Sangdaejŭng-dong
Indang
Sobok-tong
Yulgok
KŬMO-SAN
Sagok-tong
NAKTONG-GANG

SANGJU
KŬMCH'ŎN
Sŏnsan
Kumi
NAKTONG-GANG
WI-CH'ŎN
KŎNJI-SAN
PONGHWANG-SAN
KUBONG-SAN
PAEHAK-SAN
KAPCHANG-SAN
CHUHAENG-BONG
NANHAM-SAN
TŎKTAE-SAN
KŬMO-SAN
Ya-dong
Pyŏngam-ni
Yŏnbong-ni
Kŭmgong-ni
Mokkwa
Kangam
Hyo-dong
Pulligijang
Sinsŏng-dong
Umgondae
Sangp'an-ni
Samgŏri
Osim-ni
Tongwan-ni
Taejŏn-ni
Kokchung
Kwansin
Nasang
Songch'ŏn-ni
Changnae-ri
Chungdal-li
Sin'gi
Kuman-ni
Map'yŏng
Muksang-ni
Chiksin-dong
Sinbang
Moch'ang
Hoeha-ri
Kip'ŭnnae
Oga-dong
Nabo-ri
Kŭmsan-ni
Hwaryongjang
Kogong-ni
Kyesan-ni
Osang-ni
Yongsan-dong
Kwan'gi-ri
Haso-ri
Maryun-ni
Sŏgok
Sinha-ri
Kansang-ni
Kidae-ri
Maenggok
Nongch'ŏn
Tojung-ni
Sinha-ri
Chungnul-li
Naksŏ-ri
Sinan-ni
An'gyejang
Kwanje
Kujam-ni
Soksang-dong
Manwŏl-li
Chijong-ni
Songch'ŏn
Saengmul-li
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Hŭngjŏn-dong
Samp'ŏ-ri
Sujung-ni
P'yŏngo-ri
P'ansu-ri
Ŭi-dong
Wangha
Sin'gok-tong
Sangguk-tong
Mak-tong
Chamae
Chi-dong
Sach'ŏn
Songsan
T'ap-tong
Magong-ni
Sinch'on-dong
Poch'on-dong
Sangch'ŏnghwa
Chakta
Sinch'ŏn-ni
Tongsang
Suha
Sanch'ŏn-dong
Pot'ang-dong
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P'anjŏm
P'yŏngch'ŏn-dong
Chugwŏn-dong
Chua-dong
Songch'ŏn-dong
Kŭmdal-gol
Igwan-ni
Oksan-dong
Isan
Hwasil
Sagok
Oga-dong
Saenggok-tong
Tongjae-dong
An'gok-tong
Kuch'ŏn-ni
Pansu-dong
Chijang
Namgok
Mudung-dong
Musang
Tangjŏ-ri
Hado-dong
Wanjong
Sangsim
Songmun-dong
Sungam-dong
Ch'ilbong
Nolbunyŏul
Yongsu-gol
Kach'ŏk-tong
Nan'gong-ni
Sanjŏ-ri
Wŏnch'on-ni
Hwanggan
Chibong-ni
Soya
Munmu-dong
Sojae-dong
P'yŏngji-dong
Kwangp'yŏng-ni
Nŭngjŏm-dong
Kŭmgok-tong
Sambong-dong
Chup'yŏng-dong
Sŭmmun-dong
Maam
Koksong-dong
Kwonsim-dong
Toril-dong
(Toreml)
Salli-ri
Sot-nae
Pijŏm-dong
Tomyŏng-dong
Sinch'on-dong
Ponghyŏn-ni
Sinŭich'i-ri
Changch'ong-ni
Pon'ghang-dong
Kuya-dong
Paesinae
Hanggok-tong
Sin'gi-dong
Pokp'yŏng
Chanagjip-ch'ŏn
Annyŏng
NANHAM-SAN
Kŭmhwa
Kwanghan-dong
Posin
Oeye-dong
Oeagol
Naok-tong
Hanam-dong
Kŭmgok
Sangnim-dong
Map'yŏng
Yanggye
Taeji-dong
Munsong-dong
Yangjŏng-ni
Chŏl-gol
Imsan-ni
Hajung-ni
Inŭi-dong
Myegwang
Tae-dong
Namch'ŏn
Kŏŭi-dong
CR DR
CQ DQ
Kŭmsan
Chikchi-ch'ŏn
Kumi-ch'ŏn
Han-ch'ŏn
Panjŏm
Ch'ayu-ri
Tunnel
Sinch'ŏn
Chongsang
Sinjang-dong
Degongsu-dong
Sambong
Settlement
Kwangam
Nojung
Mukpang
Koja-ri
Sanggungch'ŏn
Sangdaejung-dong
Indong
Sobok-tong
Yulgok
Sagok-tong
Taehae-ri
Hwagok
Yanggok-tong
Ch'ŏnman-ni
Hamurhan
MAIN LINE
KYŎNGBU MAIN LINE

HV ASTRO STATION

1	- 2.05	LOW HV = bench marks.
2	- 4.46	figures are all
3	- 3.26	below the astro
4 (HV)	- 0.57	station.
5	- 5.92	On ship get elev. of
6	- 5.44	Astro Sta. above sea level
7	- 7.12	also pricks on photo
8	- 5.39	for loc. of
9	- 6.20	b.m.
10	- 6.04	
11 (HV)	- 0.62